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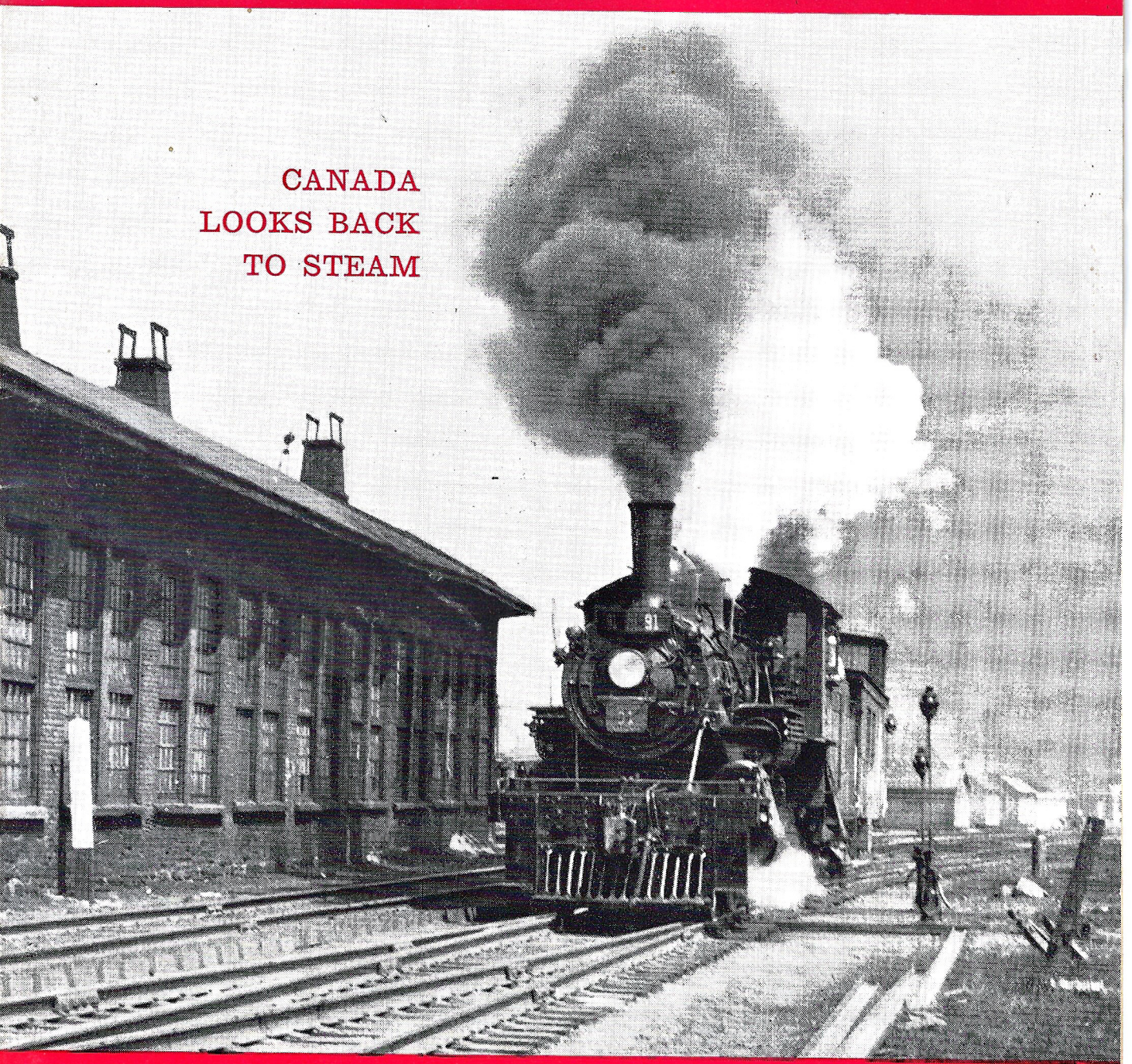

1/3 23 AUGUST 1962 VOL. 127 NO 3189

MORE MODEL ENGINEERING BOOKS

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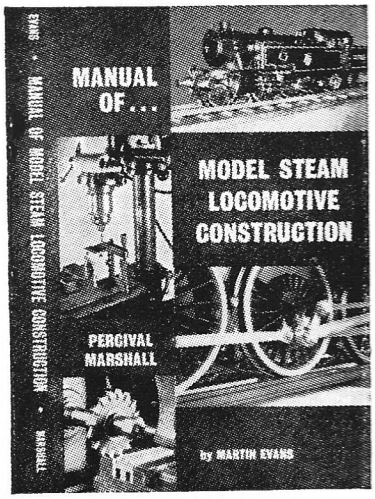

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ATOM MINOR MARK III ENGINE *by Edgar T. Westbury.* The author here sets out complete constructional details of his 6 c.c. model petrol engine, which he designed primarily for use in model airplanes. The work of constructing the engine is followed stage by stage from the setting up of the lathe to the assembly of the finished units. As can be expected from the pen of such a master of his subject more than one "trick of the trade" is offered to the reader. 56 pages. 3s., post 4d. (U.S.A. and Canada $1.00 post paid.)

MANUAL OF MODEL STEAM LOCOMOTIVE CONSTRUCTION *by Martin Evans.* 32 pages of photo plates. 122 line drawings. Foreword by H. Holcroft, M.I.Loco.E. Although there have been other excellent books on the building of steam locomotives. It is doubtful whether the subject has ever been covered in such a practical way: there are scale drawings of practically every part and fitting found in the model and all the normal machining processes involved in construction are described in detail. 32 page of half-tone plates include 82 photographs. These consist of finished models and also of locomotive fittings, set-ups in the lathe and stages in boiler making. Apart from the constructional data, chapters are also included on the choice of gauge and scale of the model, the choice of a suitable prototype on which to base it, use of fuels, raising of steam and driving etc. 30s., post 1s. (U.S.A. and Canada $6.00 post paid.)

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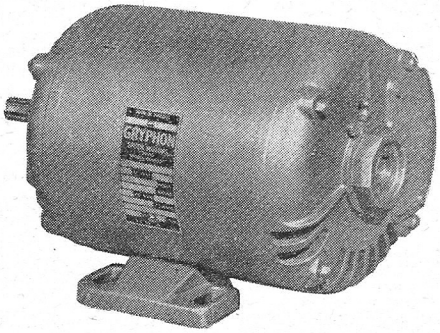

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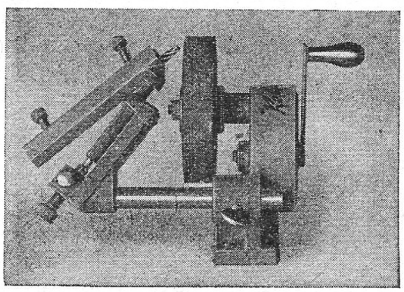

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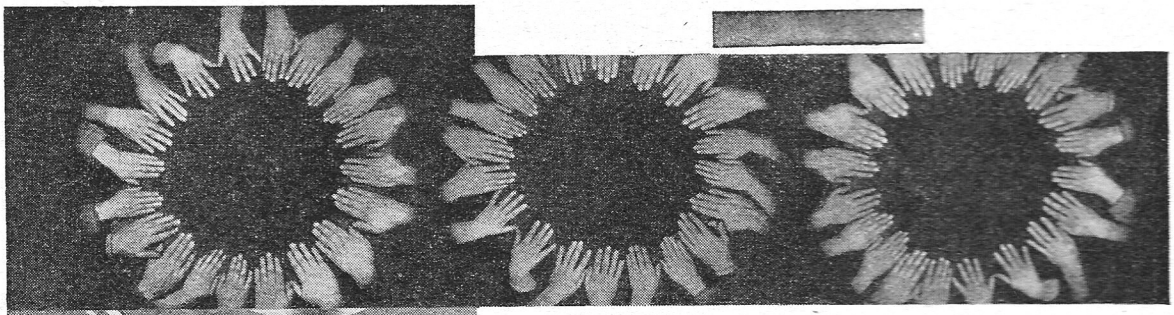

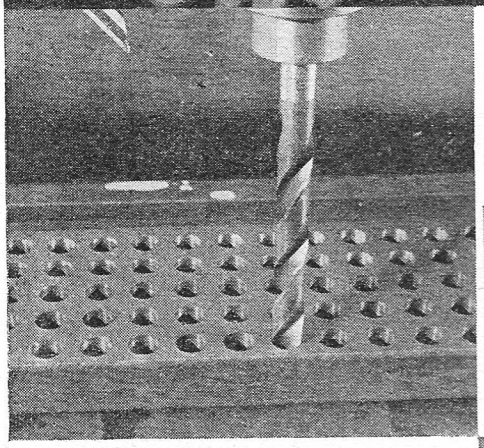

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Contents

Smoke Rings 225

Tower clock 227
Sketches of church clocks inspired its design

Wallaby o.h.v. twin 230
All set to try her out

Workshop hints 233
Taper fitting a pulley

Herzogin Cecilie 234
Odds and ends went into the modelling of this famous four-masted barque

While ships go by 237
A new series about the boats that pass Sea Reach

Canada looks back to steam 240
Third article about the Dominion's museum train

Diesel-electric from a moped unit 243
A 7¼ in. model that runs very well

Around the rallies 246
Rempstone had rain
Ely—All together at Paradise Farm

Brighouse holds a club day 249

Readers' queries 251

Postbag 253

Club news 256

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Cover picture

How would you like this engine? No 91, *a former CNR Mogul, owned by Canadian enthusiast Charles Matthews. On p.* 240 *Harry McDougal writes another article about the fate of steam engines in Canada*

Next week

Holidays have interrupted Oliver Smith's serial on the CRANBORNE. *In ME for* 30 *August he returns with details for making the stern frame from solid brass material*

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Smoke Rings

A weekly commentary by VULCAN

PHILIP KERSHAW is well known to many people whose interest lies in ships, for he has been writing about and photographing them for a number of years.

So far he is relatively unknown to readers of ME, but his first article in a new series "While Ships Go By" will serve to introduce him.

Philip, who is a London University MA, has been a shipping correspondent since the end of the war. His particular interest is mercantile marine history, with a special regard for sailing ships, including coasters and barges. But it is on steam and motor vessels, about which he is equally well informed, that he will be writing for MODEL ENGINEER.

Mr Kershaw is the author of two small books on sailing yachts and he is a member of the Nautical Research, World Ship Society.

His office—lucky man!—overlooks the Thames Estuary where he can watch London's shipping passing up and down Sea Reach.

George Layton

I WAS sorry to hear from Mr Knighton, of Bond's of Euston Road, that George Layton, their general manager, has died sudenly.

Mr Layton will be remembered by model engineers, and particularly by locomotive enthusiasts, for his friendly and helpful attitude towards their problems. He was for many years in charge of Bond's workshops and took over the management of the firm when Mr Phillips retired.

Mr Layton was a keen locomotive man and a clever designer, being responsible for such things as the slide-valve locomotive cylinder with inclined port, the gauge I combined cylinder unit, and many other developments in this field.

Shortly before his unexpected illness, he started to build a ¾ in. scale model of one of the Great Western "French" Atlantics, which would have been a most unusual and interesting engine.

His presence at Bond's will be missed by a great many MODEL ENGINEER readers.

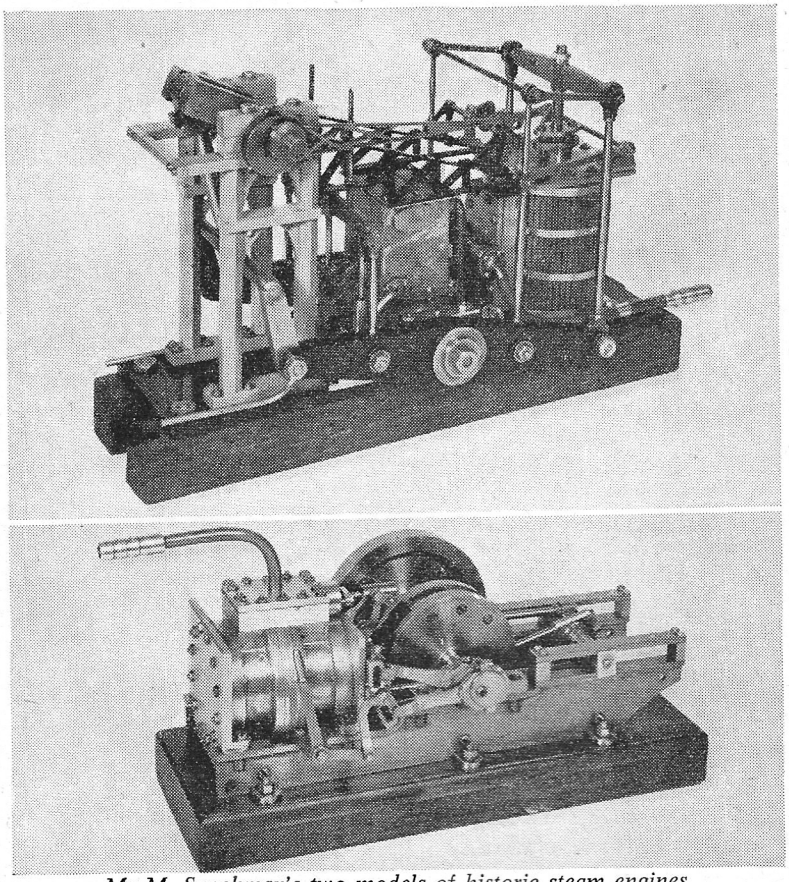
Historic engines

THIS is the season when model engineers touring Europe find time to call at the ME offices in Noel Street. And very glad we are to see them.

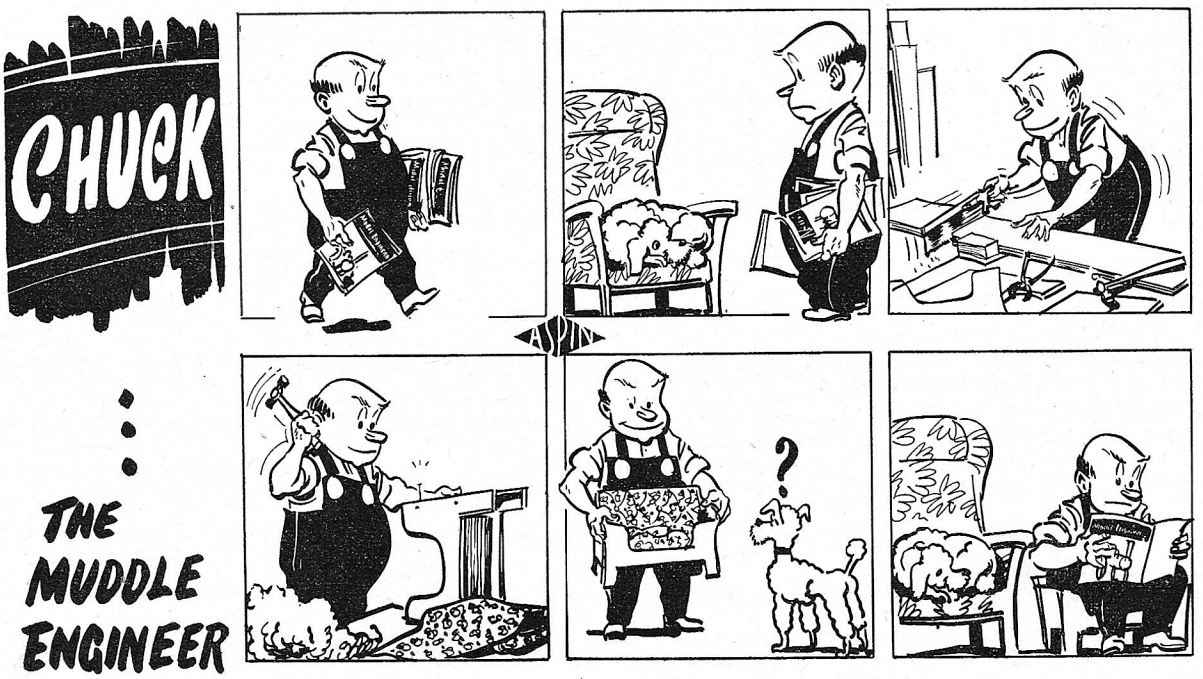
A recent caller was Mr M. Spackman, of the Suffield Experimental Station, Ralston, Alberta. His particular interest is stationary and marine engines, of which he has built several, and judging by the excellent photographs he showed me of two of his models he is a good craftsman.

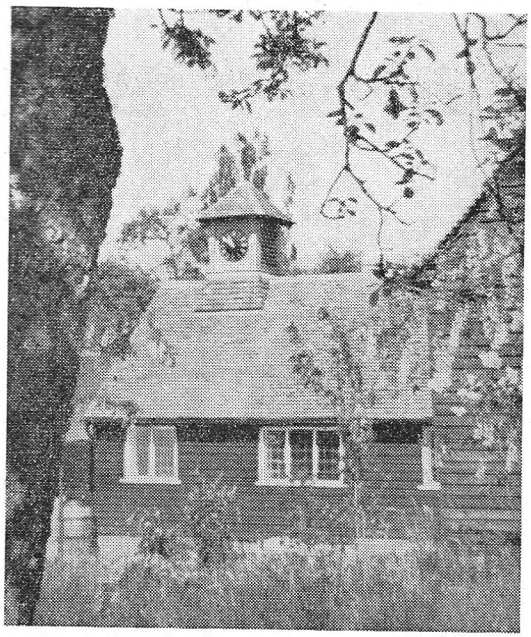
With the exception of turbines, nearly all stationary and marine steam engines are now of historic design, or rapidly becoming so. But Mr Spackman likes them not only to be historic, but unusual as well.

The beam-type engine shown in my picture is Mr Spackman's 1/10 in. to 1 ft model of a side-lever paddle engine. The original, he thinks, dates from about 1830. The other is his ½ in. to 1 ft model of the engine which powered the steamship *Barwon*.



Mr M. Spackman's two models of historic steam engines





TOWER CLOCK

J. H. WILDING wanted one and now he has it after a pleasant spell of work during which he sketched the church clocks in his own area

IT had long been one of my ambitions to own a tower clock driving exposed hands. I could imagine the rather pleasant weekly ritual of tending the mechanism—climbing loft ladders to reach the clock room, fitting on the winding handle, letting in the maintaining mechanism, pulling up the weights, adding a little lubrication here and there, and checking the clock's rate.

Then there could be the fascinating challenge of propelling the hands in all weathers to within a few seconds a week. This is no small problem. The mechanism must take in its stride temperature variations from the coldest day on record to the hottest heat wave, gale force winds which will buffet the hands in all directions, snow which may freeze on the hands and remain for weeks, and interference from birds.

Unfortunately, I have not been able to fulfil my ambitions completely. My clock is electric. There is no room for any weights to fall, as the building below is lived in and space is restricted. Nor is the clock as large as I would have liked. As the diameter of the dials is governed by their height above ground, I was limited to dials of 2 ft dia. I could have had a mechanical movement and wound it electrically, but as I already had a Jubilee Master clock I decided on one of the modern electrical movements.

Fig. 1 shows the more important working parts of a Gent waiting train movement. The pendulum *P* propels the hands through the gathering pawl *GP*, the escape wheel *EW*, the worm *W*, the wheel T and the cluster of bevel gears on the right. The drive is then taken from these gears, which would be placed centrally in the tower, to the four sets of motion gears behind the dials.

The pendulum is kept in motion by the well-known Hipp principle; I have not shown it on this drawing because the method has been described in ME. You can just see the trailing trigger and contacts in the photograph.

On the escape wheel (so called by the makers, but "count wheel" would be a more accurate description) are 16 teeth. A pin *D* is fixed to it. As the wheel rotates, the pin engages with the horizontal arm of the right-angled lever *Q* which is pivoted at *O*. This causes the lower end of the vertical arm to travel to the right and be retained by the step on the catch *C*.

With the right-angled lever thus held, the gathering of the escape wheel ceases because the top of the horizontal arm is above the level of the teeth of the wheel. The gathering pawl, which is long enough to span both the wheel and the horizontal arm, just slides backwards and forwards on the top surface of the arm.

Connected in the circuit of impulse dials and other equipment of the master clock is the relay magnet *RM*. It is energised every half-minute. As soon as this happens, the armature *A* fixed to the underside of the catch C is attracted downwards and the lever *Q* is released, allowing the gathering pawl to resume its duty of rotating the escape wheel.

The timing of the two parts of the movement gives the clock its name. The length of the pendulum and the number of teeth on the escape wheel are so designed that the cycle from the release to the declutching is accomplished in about 27 seconds. This means that the train stands still for three seconds or so before being released by the master clock.

Some of the advantages of the clock for propelling large diameter dials will now be apparent. The pendulum has no timekeeping duties to perform except for completing the cycle a few seconds before the master clock. You can, therefore, make it robust.

It is suspended by a ball race. The gathering lever is of substantial proportions. The trailing trigger is not a light delicate component as it would be if the pendulum were used for accurate time-keeping. It is heavy and club shaped. There must be no possibility of its hanging up and sticking. The bob weighs 25 lb. and describes a healthy arc.

The gathering arm is right at the top of the rod and when the oil thickens in cold weather enormous power is applied at the periphery of the escape wheel. This is immediately stepped up by a reduction ratio of 120:1 by the worm drive. It is almost impossible to stop the hands.

Bearing in mind the problems involved in driving exposed hands, you can see that this system has many advantages. Timekeeping is carried out by a precision-built master clock which will normally be housed indoors at ground level on an inside wall—away from the worst wheather and free from snow and ice. The pendulum of the tower clock movement has become a simple electric motor for driving the hands, with the added advantage that it selects its own current requirements by virtue of the Hipp toggle switch.

The makers supply several sizes of movement for different diameters and numbers of dials. For the very largest diameter of dial, 25 ft and upwards, one movement would be used for each dial, all being controlled from a single master clock.

I was fortunate in finding a movement for sale at a reasonable price. It was in need of a complete overhaul. Gents informed me from the serial number, which I had given them, that they had supplied the movement, together with one of their master clocks in 1918. As far as I can discover, the movement was installed in the Naval establishment at Rosyth in a clock tower on the playing fields. It did not give a very good account of itself, I understand, because there was no means of maintaining the batteries on permanent trickle charge. They were allowed to run down and were then recharged, a hopeless procedure as the whole success of the system depends on a constant supply of direct current.

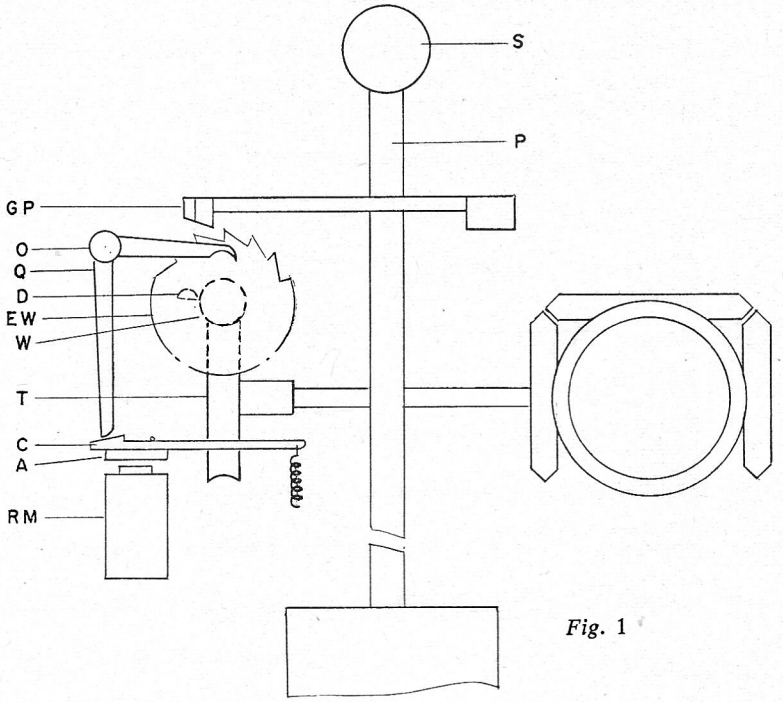


Fig. 1

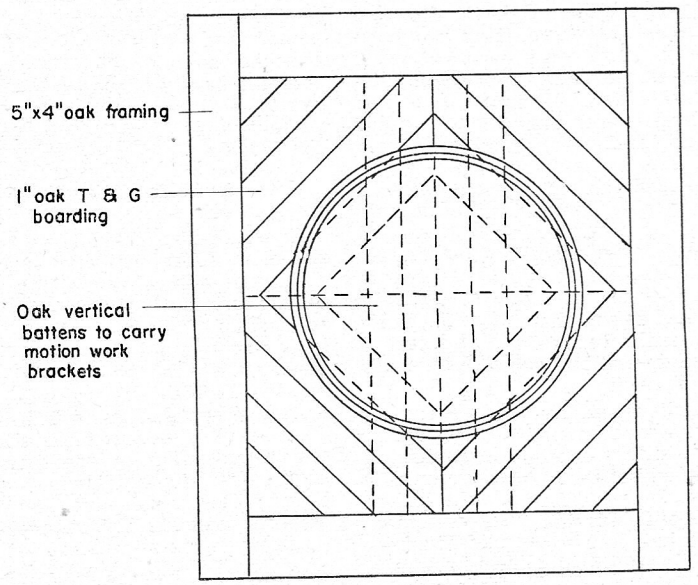


Fig. 2

During the last war the clock tower and the movement were damaged by blast from an AA gun battery. The clock was taken down, the tower was repaired, and three-legged gravity escapement movement was made by artificer apprentices to replace it.

The size of my waiting train movement is the smallest supplied and is capable of driving four 6 ft dia. dials. As my dials are 2 ft dia. and there are only three of them, the clock is considerably overpowered. But this is a good fault.

In building the tower your first step is to make a scale drawing of the elevations and, if you can manage it, a drawing giving an artist's impression of the finished tower. The usual rule for the dial size is 1 ft of diameter for every 10 ft of vertical height. I found that I tended to err on the large side all the way through. This was mainly because I had a movement capable of driving a far larger clock than the buildings could mount if the correct proportions were to be considered.

After completing the paper work, I built a mock-up from hardboard on a light batten framing. Make it sectional, so that on a still day the sections can be carried up on a ladder and placed in position on the roof. Slight variations in dial diameter can be drawn on in chalk,

and then the whole thing can be photographed from various directions and examined at leisure.

The construction was carried out by a local builder. He was enthusiastic over the whole project and went to great trouble to match the tiles and blend the addition in with the existing buildings. The tower itself was made entirely of oak in the builder's workshops, and the standard of workmanship was of the highest.

When the tower had been completed, the roof was opened up for the plinth to be built up from the roof rafters, which themselves were given additional support. The tower was carried up in sections and assembled.

The tiling was the most tedious part of the work, as a great many of the tiles had to be cut by hand on the job. Special tiles were obtained for the diagonals of the roof; conventional hip tiles would have been too course and bulky. Wire-netting was, of course, fitted under the eaves to keep out the birds.

There are three dials. The fourth face of the tower is a louvred door which gives access to the movement so that the mechanism can be maintained. It is possible to reach the movement from the inside and set the hands, but space is restricted, and the lubrication or adjusting is more easily carried out from the outside. The louvres will provide an escape for the sound of the bell which is to be placed right in the apex roof.

Fig. 2 shows my method of filling in the faces of the tower. Tongued and grooved oak boarding is screwed into the rebated oak framing. The centre is left open as, of course, the dials cover that part.

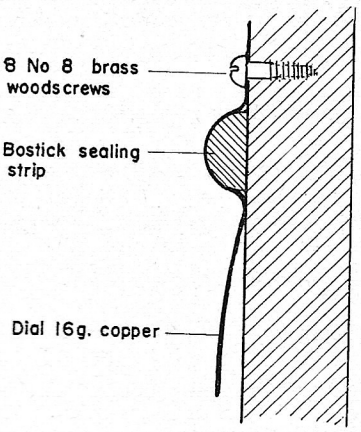


Fig. 3

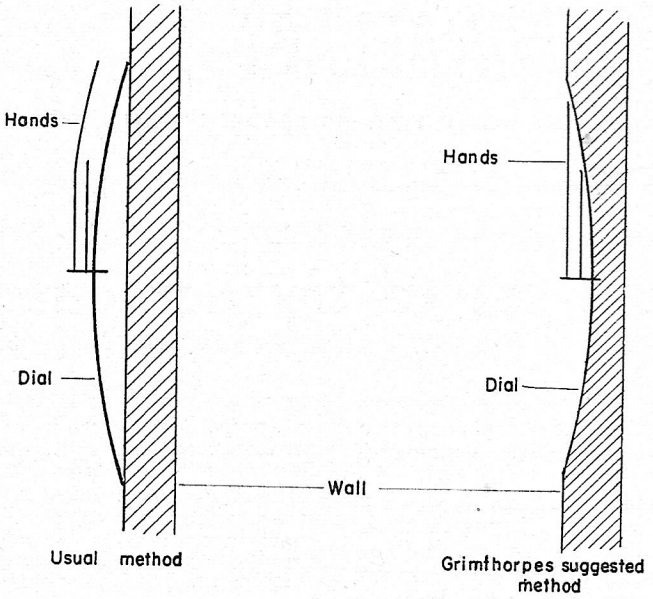


Fig. 4

The dials caused me the biggest headache. I could not find any book which dealt with their construction. I was in no doubt of the style as this was dictated by the traditional design for the particular district. By far the most popular was the domed copper dial. I spent much time looking at private stable clocks and clocks on churches. Carrying a pair of binoculars, I sketched the designs of hands, numerals and writing. I came to the conclusion that the dials must be domed or convex, that they should have some sort of finish round the edge, either a lip or some sort of beading to frame them, and that they must be fixed round the edge by screws.

It was out of the question for me to spin 2 ft dia. copper discs myself, and it was with great difficulty that I found a firm of sheet metal workers to undertake this for me. I had no idea how much convexity to order. My guess of 1 in., measured at the centre of the dial, seemed to be about right.

I also ordered a $\frac{1}{2}$ in. lip to be spun round the edge. Besides looking well, this is useful for packing with sealing strip, to help prevent water from seeping in behind the dials.

Fig. 3 shows the method of fixing the dials, and the lip with the sealing strip.

Of course, I have learnt much. The doming is carried out to give the dial rigidity and stiffness. One can well imagine what would happen to a sheet of copper 6 ft in diameter if it were flat and fixed only round the edge. During heavy weather it would flap; but for a diameter of 2 ft I doubt very much whether you need go to the trouble of doming. (Formica would be most suitable as well as being comparatively cheap.)

Another disadvantage of the convex dial is the problem of the parallax error which is introduced when the dials are viewed from an angle. It is very difficult to get the tips of the big hand close to the dial. Lord Grimthorpe, author of *Clocks, Watches and Bells,* offers practical advice on the subject as one would expect from him. He says that the dial should be *concave* not convex, as not only would the parallax problem be completely solved without our even having to bend the hands, but also the hands would be more sheltered from snow and wind.

This would seem to be the obvious answer, and yet I have never seen such a dial, I wonder why? The only reason that I can think of is that it is rather harder to fix such a dial to the wall as the brickwork would have to be gouged out or a circular raised plinth mounted on the wall (see Fig. 4).

★ *To be continued on September 6*

WALLABY

OHV TWIN BY EDGAR T. WESTBURY

Concluded

All set to try her out

I HAVE already explained that there are several systems of ignition which can be used on a twin engine of this type. The arrangement and wiring diagrams are obtainable from the ME Plans department (PE10) and I do not propose to deal with them in detail here.

In my experience constructors prefer to employ the orthodox system of single coil and h.t. distributor used on most motor cars.

There are, however, several cars which have more than one ignition coil, and at least one well-known car has an individual coil for each cylinder.

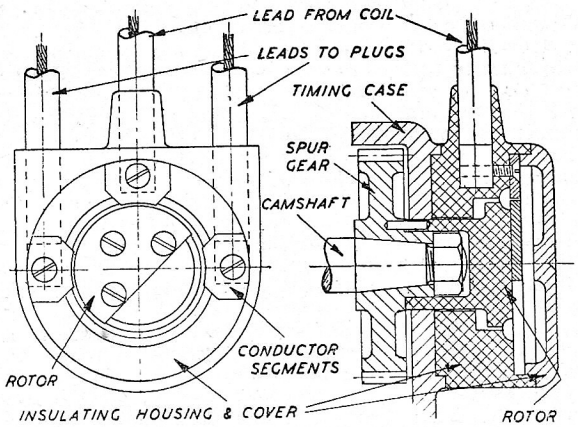
All coil ignition systems, except those which are electronically controlled, have some kind of contact-breaker in the low-tension circuit. For the *1831* engine it was made as a separate part so that it could be applied to different arrangements and also to simplify the construction and wiring. The combination of l.t. contact breaker and h.t. distributor, as on motor cars, involves some difficulties when the size is reduced to scale proportions, though it has been adapted successfully in the case of the *Seal* and *Sea Lion* engines.

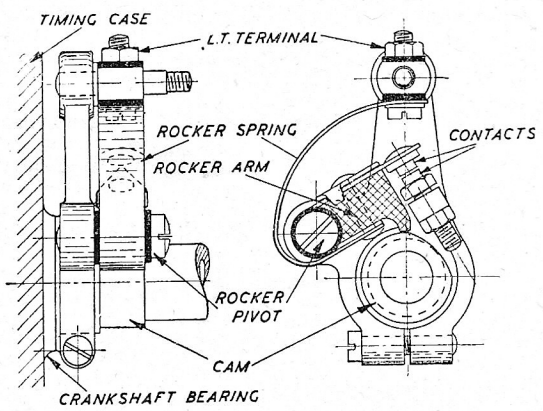
The *1831* contact-breaker, designed to operate from the engine shaft, is simple in construction and employs a ready-made rocker arm and spring, of a type which is readily obtainable from garages and service stores. The backplate may be made from a casting or machined from solid; apart from the outline, it involves no complicated shapes. It is bored to a wringing fit on the spigot of the timing case, and then the clamping lug is split, preferably with a small circular saw in the lathe, though a hand saw is equally effective, if rarely so neat. In any fittings which involve split clamps of this kind, the latitude provided by the width of the sawcut should never be an excuse for sloppy work, or the clamp will be distorted and will fit imperfectly, no matter how tightly it is screwed up.

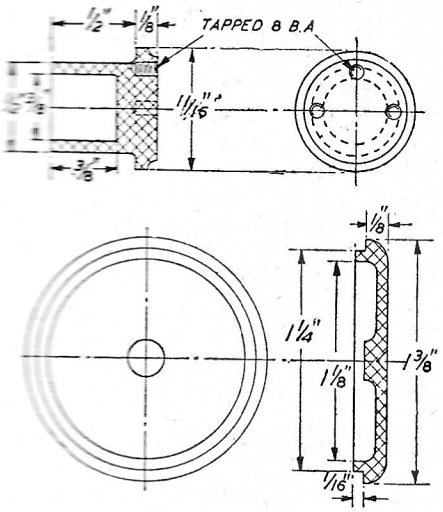
In drilling the holes for the rocker pivot and contact block, it is important to place them so that the stationary and moving contact points line up properly, and it is advisable to check by placing the components in position on the backplate. A dummy cam, with an enlarged rear extension to fit the split clamp, will allow the rocker to be set at the correct angle for this check. The cam itself, which I have referred to in dealing with the crankshaft fittings, can be incorporated in the oil retainer sleeve. Its contour is not critical, but should not be too abrupt in making or breaking contact. The period of "make" should not be more than 90 degrees. For economy on current, you can often work with a very short period. The cam should be timed so that the points are just barely broken, at t.d.c. with the contact-breaker lever vertical.

The rocker arm has a spring attached to it which serves as a live electrical conductor and must therefore be insulated from the backplate. It will be seen that the attachment stud is flattened on both sides, and fitted with an insulating bush and washer, for this purpose. But sometimes the rocker spring has a looped instead of a flat tail, in which event the means of attachment must be modified; the essential thing is that it must be securely attached and insulated. The contact post, which is drilled and tapped to take a tungsten-tipped screw, is riveted into the backplate just tightly enough for it to be set into alignment, after which it may be made permanently secure.

The distributor is simple, and its design permits the wiring to be neatly arranged, compared with the more usual type in which the leads come out parallel to the shaft axis. It is important that you select a suitable material for the insulation, as both its electrical and mechanical properties affect its success. Ebonite, which is a compound of rubber and sulphur, is an excellent insulator,







Distributor rotor and cover

but is not mechanically stable, and is liable to deteriorate in the proximity of oil vapour.

Phenolic compositions with paper or fabric bases are often difficult to machine without their breaking or fraying at the edges, and are also liable to tracking of h.t. current over the surface unless it is prevented by surface treatment. After many experiments, I have found that cast phenolic or acrylic plastics, containing no fillers, are most reliable. Perspex, in its transparent form, will appeal to many as it provides a visible firework display when it is used for this purpose.

Whatever material is used, the surfaces subject to electrical discharge must be highly finished, but polishing by abrasive methods is not desirable, as it encourages tracking. Machining should be done with keen tools, so that little further treatment is necessary. The distributor housing can be machined from solid, including the projecting boss for the centre lead and for boring and recessing the front, and turning the rear face and spigot, which should be concentrically true and a good fit in the recess machined in the outer face of the timing case.

The distributor rotor and cover are machined from the same materials as the housing, and are similarly finished. In fitting the screws which secure the conductor segment to the front of the rotor, take care not to drill the tapping holes too deeply, or there may be a risk of flash-over to the metal of the camshaft gear boss. The rotor sleeve should be a push fit on this boss, and arranged for timing (which is not at all critical) by a notch in its edge, engaging a pin in the face of the gear. End movement of the rotor is prevented by a small boss in the centre of the cover.

The metal parts of the distributor are very simple. It might be possible to attach the conductor segments to the rotor and housing by Araldite or another special adhesive, thereby avoiding the need for screws, but the screws also serve as terminals to fasten the ends of the h.t. leads, which are pushed into the small bushes fitted to sockets in the housing. In this way a simple, electrically sound and mechanically secure fitting of the three leads is provided. Good insulation of the leads is most essential; I recommend heavy p.v.c. covering. If the external diameter does not fit the sockets, sleeves of the same material should be fitted to take up clearance and exclude water, oil and dirt.

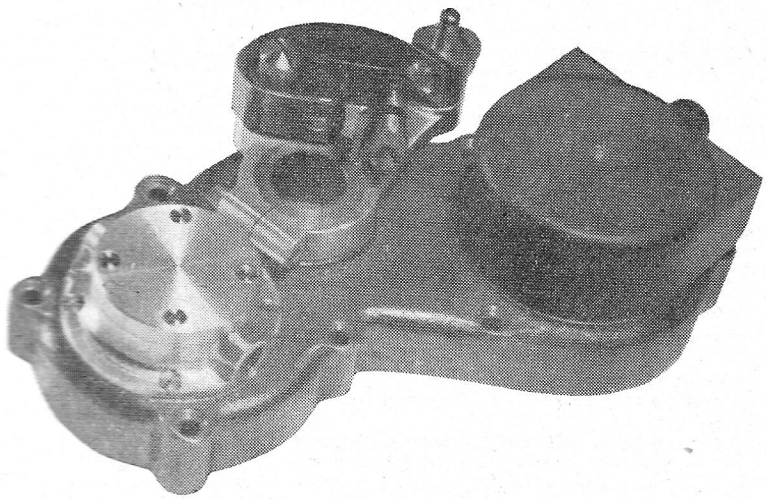
The edges of the conductors on both the rotor and housing should be machined after assembly, to give a clearance of about 5 thou between them when the engine is working. It is now accepted practice to allow a small spark gap between conductors in h.t. distributors, as the use of carbon brushes or other rubbing contacts in earlier distributors often caused trouble by tracking or excessive wear. The complete assembly is held in position by a bolt with a spring clip, as used for many years with magneto contact-breakers. This allows some latitude of angular position, but timing movement of the distributor is not necessary, and the only virtue of the fitting is that it provides ready access to the components for inspection and cleaning.

As the wiring of the ignition system is identical with that of motor cars, I need not explain it in detail. Briefly, the contact breaker, shunted by an appropriate condenser, is connected between the coil l.t. and earth on the live side of the battery; polarity is not usually important, but sometimes the engine works better one way than the other. The coil h.t. lead is taken to the centre terminal of the distributor, from which the other leads are run to the appropriate sparking plugs.

A really good ignition coil, such as the Runbaken Mini-coil or the Wipac motor-cycle coil, with the condenser specified by the makers, is essential to successful ignition; avoid super-lightweight coils, unless they can be positively *guaranteed* to give the desired results. Equally important is the provision of an adequate current supply. Dry batteries, unless they are of much larger capacity than any of the popular sizes, are not reliable owing to their voltage drop on closed circuit; accumulators, which have a flat voltage output on discharge, are much better, but they must be properly charged and maintained.

The Atomag Minor is quite suitable and will remove all worries about batteries. It may be gear- or direct-driven at crankshaft speed, with the h.t. lead taken to the centre terminal of the distributor, and the contact-breaker on the engine eliminated.

Several different carburettors have been used with success on this engine, including those designed for some of my earlier units; the *Wallaby* is not a temperamental



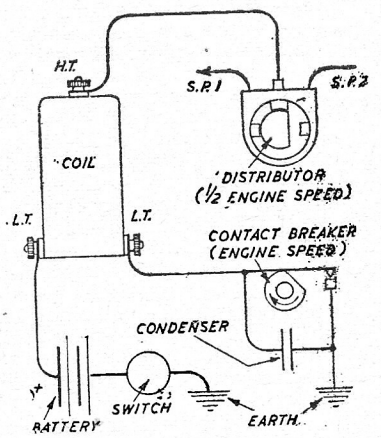
Timing case with oil pump, contact-breaker and distributor in position

animal where feeding is concerned. I do not propose to give a detailed description of the original *1831* carburettor, as you can get a fully detailed blueprint. While it is not really difficult to construct, and gives an exceptional range of control, if it is adjusted properly, many readers have objected to its size in relation to the engine and have demanded something more closely related to scale proportions.

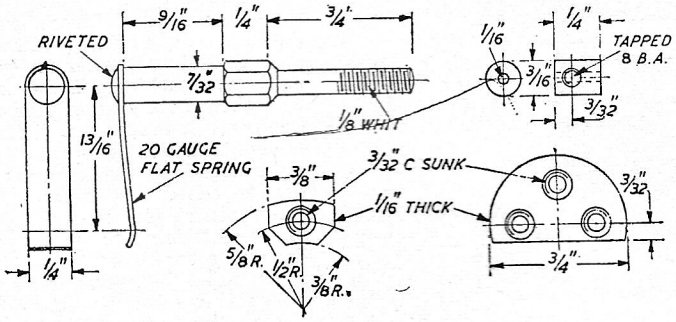
The Atom Type R (PE8) is quite suitable, but many fail to understand its working principles, and as a result it is often found in very imperfect adjustment. On the whole, I think the *Kiwi* carburettor (PE12) will suit average requirements best. Although its compensation is incomplete, it will give satisfactory control on almost any old engine (other things being in working order) and is simple to build and adjust. The modern development of this carburettor was fully described in the articles on the *Kiwi* Mark II 15 c.c. engine, and detailed blueprints of it may be had.

Whatever type of carburettor you adopt, you should note that the main air passage, at *is* narrowest point (normally the throat or choke tube) should be related in area to the capacity of *individual* cylinders rather than total capacity, unless four or more cylinders are employed. This is because in singles or twins the flow of incoming air is intermittent, not continuous, and the air passage must take account of maximum demand so far as possible. Therefore the *Kiwi* carburettor, designed for a 15 c.c. single, will give good results on a 30 c.c. twin.

The natural temptation to open out the size of the throat should be resisted, unless it is found on test



Wiring diagram for single-coil and distributor system. Contacts have just broken and No 1 plug is firing



Details of the metal parts of the distributor

that the engine is suffering from bronchial restriction at the maximum *working* speed. Too large an air passage is liable to make starting more difficult and to impair the acceleration of the engine, or its ability to slog away under heavy load, and to recover from the effect of a temporary overload.

I need not say a great deal about the assembly, as I have dealt with the subject many times before, and there should be no snags if the components have been accurately made by the methods described. The particular design involves much the same methods of assembly as those of motor cars, and demands no more than a modicum of common-sense, plus a little more meticulous care than usual, owing to the size of the parts. The main and big-end bearings may be fitted by the good old-fashioned "scraping and bluing" technique, which, I am afraid, many motor mechanics nowadays have either forgotten or have never learned!

Timing

The camshaft timing may be carried out by reference to top dead centre on either cylinder, with the camshaft gearwheel only lightly secured to its shaft. A copy of the crank timing diagram may be fixed to, or marked on, the flywheel, and used to check the opening and closing of all four valves. If the full opening periods are not attained, owing to errors or lost motion in the valve gear, the differences should be halved out, but the need for this measure will depend on the accuracy of all the parts, including the meshing of the gears. All backlash should be taken up in the direction of drive.

A small i.c. engine, unlike a steam engine, cannot be made to work by the application of brute force, and the presence of any stiffness or high spots in working parts may cause it to run only very laboriously or not at all. You should run the engine in from some outside source of power for several hours before attempting to run it under its own power. This gives you an opportunity to check up on details such as lubrication, valve operation, compression, and (to a limited extent) carburation and ignition. Plenty of oil should be allowed during this operation. However scrupulously the parts have been cleaned before assembly, the oil will at first come out black, owing to the presence of dirt and metal dust. Ideally, running-in should be carried on until the oil comes out clean, but *ars longa, vita brevis*, and this process would also preclude the use of running-in compounds such as colloidal graphite, which is undoubtedly beneficial during the early life of most engines.

After running-in, the engine should be sufficiently free to be spun freely by hand, if the plugs are removed; and when they are fitted, the compression should be distinctly bouncy. Attention to these details will go quite a long way to provide efficient and trouble-free working over a very long period.

There are many virtues in *good* engines besides sheer power and speed; like friends, they should not be valued merely for what we can get out of them. Few readers, I trust, regard engines, or any other models, as only a means to an end. The pleasure obtained in building, and the satisfaction of a good job well done, are the main attractions; and builders of the *Wallaby*, I am sure, will not be disappointed in either respect. ■

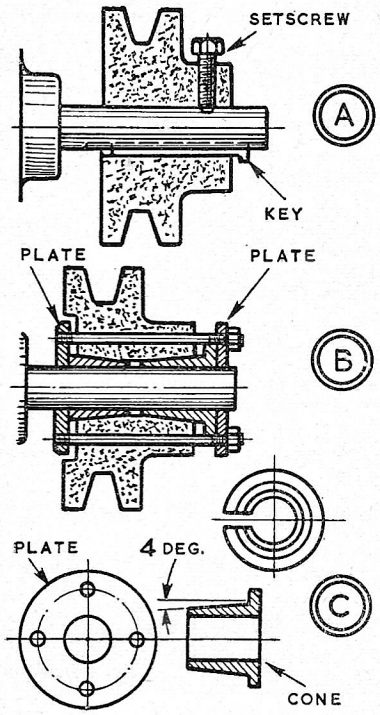
● *This serial opened on April 29 (page 475). Other instalments were published on May 3 (559), May 17 (606), May 31 (667), June 14 (734), June 28 (811), July 12 (56), July 26 (116) and August 9 (173).*

Taper fitting a pulley

By GEOMETER

A TAPER and nut provide reliable means of fitting a component to a shaft, whether the component is a pulley, a flywheel, a gear or a sprocket. By tightening the nut, the bore of the component is forced into very firm contact with the shaft, so that light drive can be transmitted without a key, although a Woodruff key is usually included for security. A puller must be used to remove the component from the shaft.

In the design stage, the shaft and component can be proportioned for this standard fitting. Sometimes, the taper fitting can be provided later by altering a parallel fitting. The shaft is turned down at the end, threaded and tapered; and a bush is made for the component. On occasion, this is not possible, although the circumstances indicate that a taper fitting would be a distinct advantage for security.

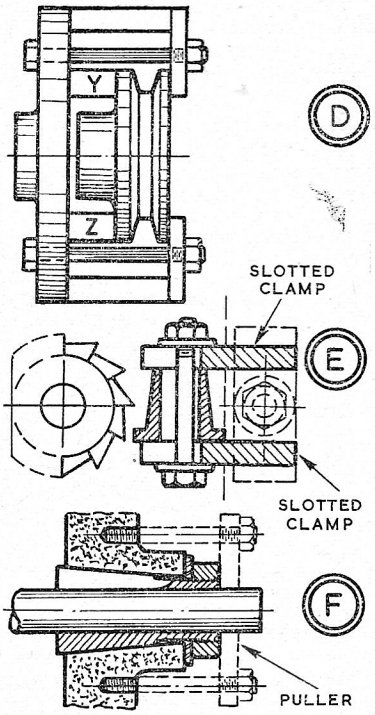


One instance, which recently occurred, involved the fitting of a light-alloy V-belt pulley on a mild steel shaft, as at *A*. The pulley was a reasonable fit and had a key and setscrew in its boss. But it would keep working loose, perhaps because the driving and driven shafts were connected at right-angles through the single twisted belt. This arrangement had been adopted to keep the drive as simple as possible, for the alternative would have been bevel gearing in addition to the belt and pulleys.

Various means were considered to hold the light-alloy pulley securely, among them the principle of the collet chuck, in which the split collet grips parallel around stock firmly as it is drawn into the body or backplate. It does not matter if the round stock is slightly oversize, or if it is a thou or two small. The split collet accommodates small differences in diameter. You tighten the chuck until the stock is secure. Obviously, this was the method to hold the pulley without one's having to alter the shaft—although, of course, burrs were cleaned off and it was polished smooth.

The pulley is now fitted as at *B* and has not moved since it was first tightened. It was bored out taper each side to take a pair of mild steel split cones, the outer one flanged and the inner one plain. They grip the shaft as they are drawn into the pulley. This is done by a pair of plates with studs and nuts, the pulley being drilled for the studs to pass. The key in the shaft protrudes into the slot in each cone to give a positive drive. Drive between cones and pulley is the friction of the tapers—although the outer cone could have been made with a larger flange for the studs to provide a positive drive. The reason for the flange on this cone, which is shown at *C*, is to admit of using a claw puller to loosen the assembly.

The taper on the cones is 4 deg. A dummy mandrel was turned to this angle to gauge the tapers in the pulley so that both should be the same. The pulley was set up as at *D*



on the lathe faceplate. For boring the rear side, packing was placed to the faceplate, *Y-Z*. For boring the boss side, the pulley was clamped direct to the faceplate. With the use of topslide feed, the tapers were opened out until the dummy entered to a scribed line.

Two mild steel off-cuts were used for the cones. Each was chucked, faced, centred and drilled, bored to a good sliding fit on the shaft, rechucked, and faced on the reverse side. To machine the tapers, a stub mandrel was turned for the pieces to be pushed firmly on, one at a time. Each was machined to fit the taper in the pulley, with a distance to draw by the plates. These are in mild steel too, each left with a round bore to contain the key.

After the marking and centring, the plates were drilled and tapped for the studs. The outer one was used as a template to dimple the pulley. For splitting the cones, each was set up between slotted clamps, as at *E*. These were then clamped to the vertical slide.

Diagram *F* shows a single split cone fitting with a washer and nut which can be used as an alternative for a pulley or outer component with a thick boss or web. ▣

HERZOGIN CECILIE

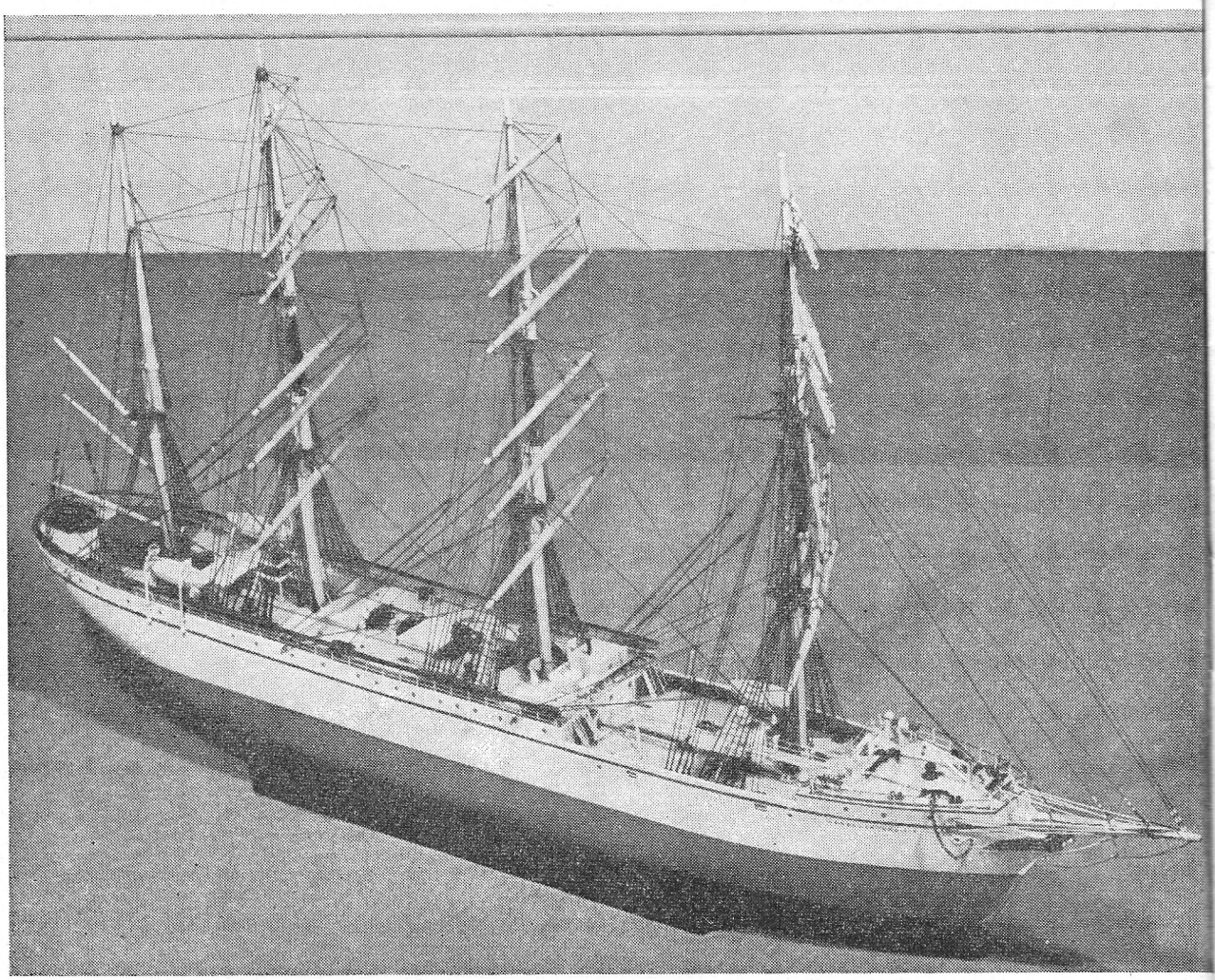
THE desire to build a model of the *Herzogin Cecilie* came to me after reading W. L. A. Derby's *The Tall Ships Pass,* a splendid book about the last years of the ocean-going square riggers. It tells in detail the story of the four-masted barque which ended its days tragically in Starhole Bay, off the Devon coast.

The author had the needs of modellers in mind. Besides numerous photographs, the book contains several excellent deck and rigging plans. As the deck plan measures 11 in. overall (not including the bowsprit) I arrived at the size of the model I required by multiplying the plan by three; this gave an overall length of 33 in., a size suitable for including almost all but the smallest details.

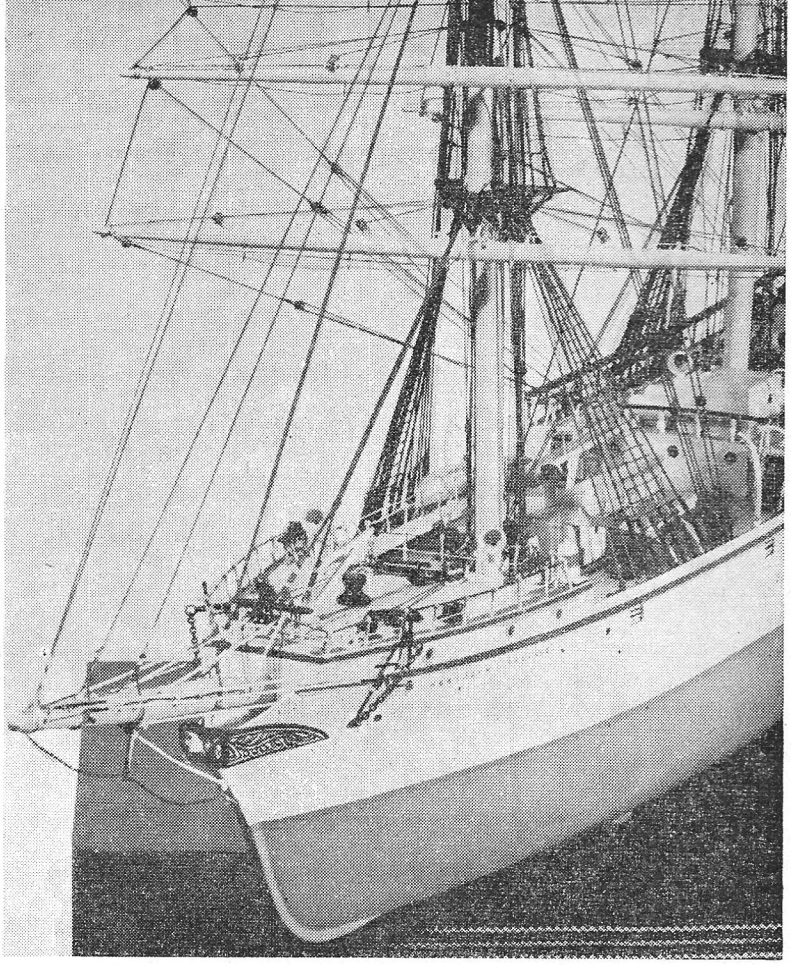
I made the hull in the familiar bread-and-butter fashion, using $\frac{3}{8}$ in. thick yellow pine boards, and building up to a depth of just under 3 in., which took the hull up to the main deck. I had previously cut out all the unnecessary wood from the centre with a padsaw and other tools.

After using water-resisting glue and putting the rough hull in a bench vice between the two heavy boards until the glue had set, I worked on the hull with rasp and spokeshave. By using hardboard templates to get the correct hull sections, I produced a hull which was surprisingly light and rigid, with walls about $\frac{1}{4}$ in. thick, or just under. After cleaning the interior, I got a piece of $\frac{3}{16}$ in. mahogany for the main and poop decks, and a piece of $\frac{1}{16}$ in. plywood for the fo'c'sle deck.

The poop deck, which could be mistaken by some for the main deck, runs almost two-thirds of the hull length. This deck and the others were glued and pinned in position. I fixed them to the $\frac{3}{16}$ in. square section timber which runs the length of the decks; it had previously been glued and screwed to the inside. Fine-grained and seasoned timber for the decks can be slightly bent to



WOOLWORTH COMBS, PART OF AN OLD NECKLACE AND THE HANDLE OF A DISCARDED KITCHEN KNIFE—ALL WERE FOUND USEFUL BY E. V. LANE WHEN HE MODELLED THIS FAMOUS FOUR-MASTED BARQUE



Many visitors to the last ME Exhibition saw the author's model, built at 1 in. to 9½ ft. In June 1936 the 3,111-ton barque was refloated after running on to the Devon coast in April while she was taking part in the annual grain race from Australia. Later her back broke. She was built in 1902, and before 1914 was a training ship for the Norddeutscher Lloyd Line

give the right amount of camber, which is essential athwartships.

I first marked out where the masts would enter, and fixed suitable wooden boxes in the base of the hull interior to take the feet of the masts. For the mast and yards I used a very hard piece of mahogany, a $\frac{5}{16}$ in. board from which I cut the 18 ft or 20 ft of strip which I required.

Before fixing the masts, and while the decks were free of details, I thoroughly shaped and cleaned up the hull and decks, which I then primed, and painted with several undercoats. When I had the decks really smooth and flat-painted off-white, I marked out the planking with a very hard pencil. I then rubbed on a coat of orange shellac polish which, although it was probably unorthodox, gave the right colour and fixed the pencil lines. It dried very quickly, did not object to warm hands, and gave the decks just enough sheen to make them look holystoned.

I will not attempt to describe the erection of the masts and shrouds; abler pens than mine have described them in ME over the years. But I would like to mention a few details which may help others.

The cross tree, futtocks, and so on, I made from hard sheet brass, which works and drills easily, and takes without bending the quite considerable strain of shrouds and stays which occurs even on a model. I made the portholes by buying two large transparent combs from Woolworths, cutting the backs and handles down the middle, and shaping them into dowels of about $\frac{3}{32}$ in. dia, which I then cut into short lengths of $\frac{1}{4}$ in.

Before press-fitting them in position, I cleaned each port with flour paper and metal polish until they were almost as clear as glass.

For the goosenecks which hold the three fixed yards in position I used soft household pins. I made the short lengths of chain, which also help to hold them, from some very fine chain which came off an old necklace. The metal collars which slide up and down the mast, holding the other three yards, are simply made from thin strip tin, and are joined by minute rivets made from soft copper wire.

Foot and hand ropes on the yards were from fuse wire, as were parts of the hand rails round the poop and fo'c'sle decks.

The standing (fixed) and running rigging of any model needs much care and patience, if it is to be modelled properly, and I have heard that every rope on a ship should be underscaled, if anything, to give the quality of grace, so essential in a sailing ship.

The blocks, deadeyes, and other small details, were quite formidable to make because of their size. I used sticks of seasoned walnut, about $\frac{3}{32}$ in. dia., drilling down the middle about $\frac{1}{2}$ in. at a time, with a drill made out of a needle sharpened to a chisel edge on a fine stone and held in a pin vice. Then I cut a tiny groove round the block, with a single-edged razor blade, and parted off the block by rolling the stick under the blade.

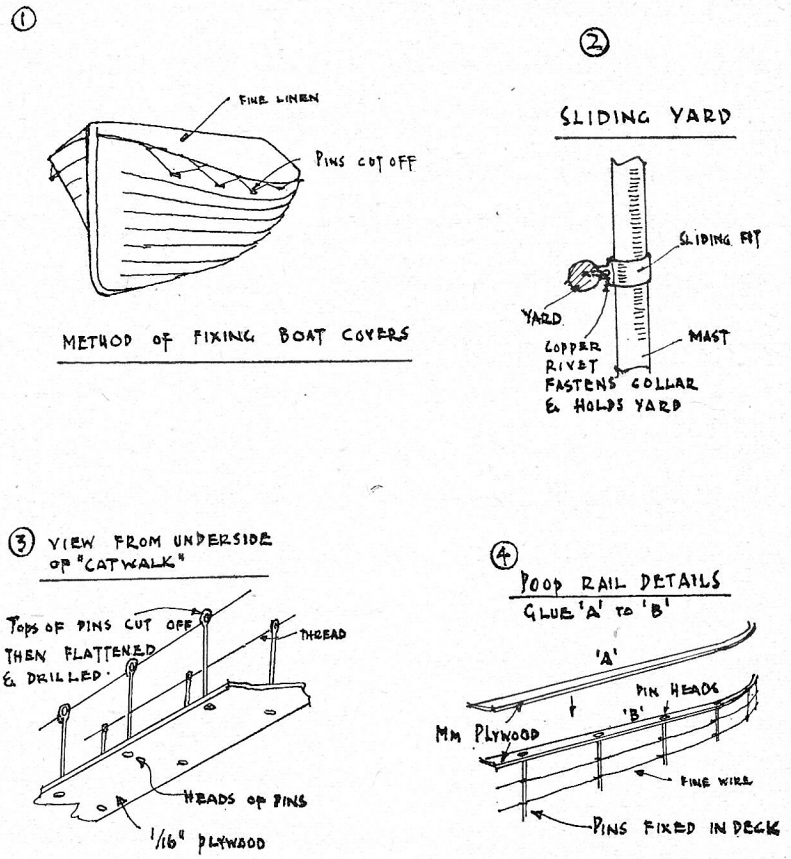
I made a great number of these things, as they were so small that I often lost them while I was parting them from the stick. A faint tink-

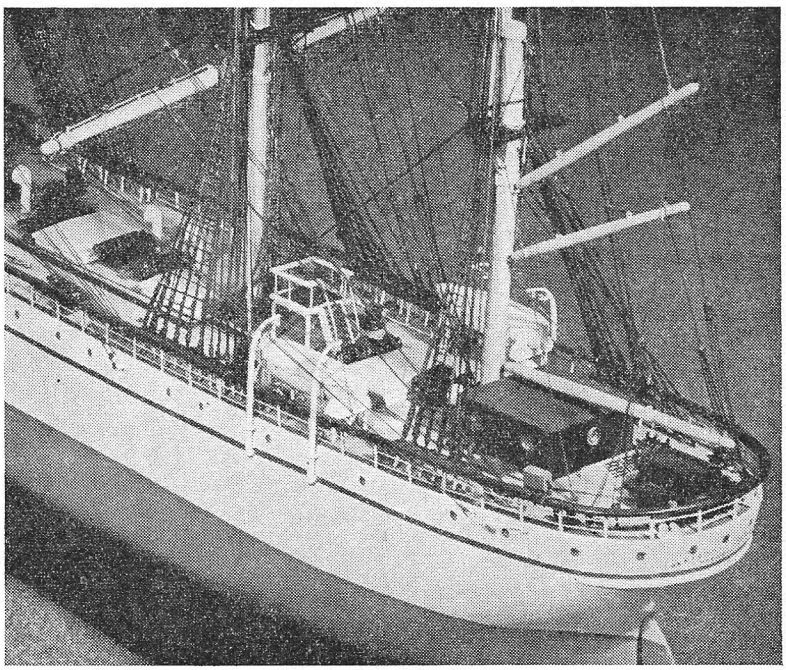
ling in the vacuum cleaner the next morning told my wife that another one had been found.

For the vents on deck I moulded plastic wood on a small former. When they were hard, I finely sandpapered them down, and stuck on scale-sized shafts. Their inside had a sky-blue finish. The ventilators, capstans, ship's lamps and patent log, have panel pins let in, and projecting from the bottom of each. These enabled the fittings to be lifted from their positions on the deck for cleaning. As a model of this size, about 38 in. overall length and 21 in. from keel to top of mast, is perhaps rather larger than usual for showing in a glass case, the ability to take many of the deck fittings off for careful cleaning is very useful, as I have found.

Lifeboats and dinghy were carved from soft white wood, and covered with fine linen covers. To hold the covers in position I sewed the edges to pins set round the top of the boats and cut off short. I made the davits from soft brass wire, thinned down one end. There are two pairs of davits on the main deck and two pairs on the poop.

The flying bridge, as it is sometimes called, connects the poop deck with the fo'c'sle deck, and would have been essential in heavy weather. It is made of good quality $\frac{1}{16}$ in. ply, as is the fo'c'sle deck. For the handrail on the flying bridge, or





catwalk, I pre-drilled the narrow deck, and then pushed up ordinary pins through the holes (afterwards putting on a spot of Durofix to hold them tight). I then nipped off the pins to the desired length, flattened the tops, and drilled holes to take the top rail—fine waxed thread.

The main handrail on the poop deck was made by cutting narrow strips of 1 mm. plywood (not always easy to come by), carefully drilling it, and then pushing pins through the drilled holes and into the deck, in their correct places.

When the stanchions (pins) were fixed in position, I glued another narrow strip of 1 mm. plywood on top of the first, thereby covering the heads of the pins, sandwiched between the strips of plywood which, of course, were previously glued.

This handrail was very delicate while it was being constructed and called for much care, especially around the stern of the ship, as the finished width of rail is no more than $\frac{3}{32}$ in. But I can lift up the

● *Continued on page* 242

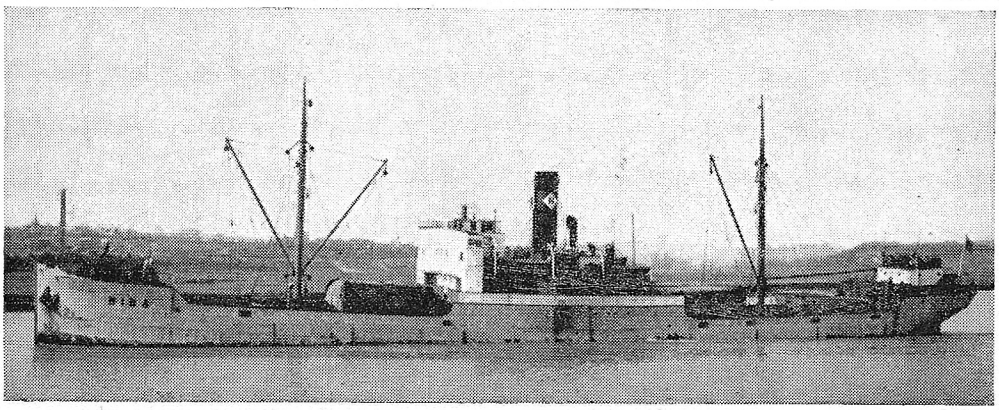
LARGEST VESSEL TO ENTER THE THAMES

From his office overlooking the broad mouth of the Thames PHILIP KERSHAW watches boats coming from and going to the four corners of the earth. Here he writes the first of a series that will interest "Ships and Ship Models" friends

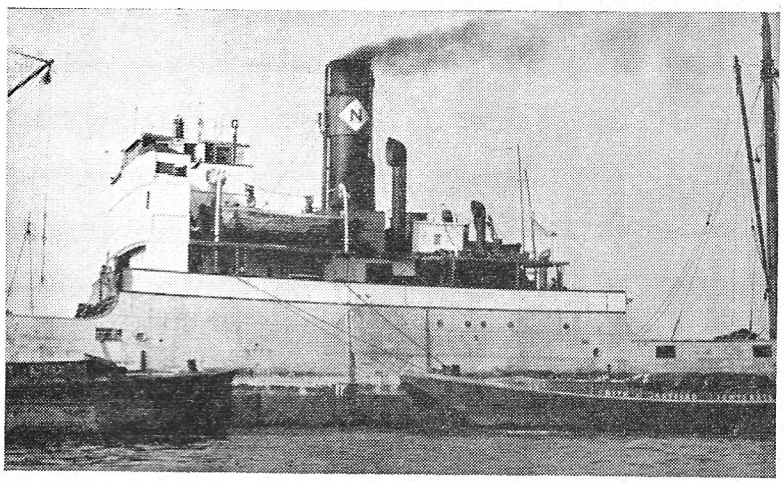
LONDON'S port records were broken recently when the British super tanker *Naess Spirit,* 41,327 tons gross, discharged 49,000 tons of Venezuelan crude oil at Thames Haven. Having had endless arguments with my friends in the port on the identity of the largest vessel to enter the Thames, I was glad to find this problem decisively solved.

In both overall length and gross tonnage the *Naess Spirit* now holds the record; she is some 2,600 tons larger than the Holland-America liner *Rotterdam* and 12 ft longer than the Liberian tanker *Olympic Challenger,* the previous contenders for the title.

The *Naess Spirit* was laid down in the West German Howaldtswerke yard at Kiel. She was launched in April, 1960, and completed about four months later. Her owners are the Norcape Shipping Co. (Bermuda) Ltd, but she is managed by Naess Denholm and Co. Ltd of Glasgow and London.



Right: The Finnish steamer NINA *in the River Medway Below: Close-up of* NINA'S *superstructure*



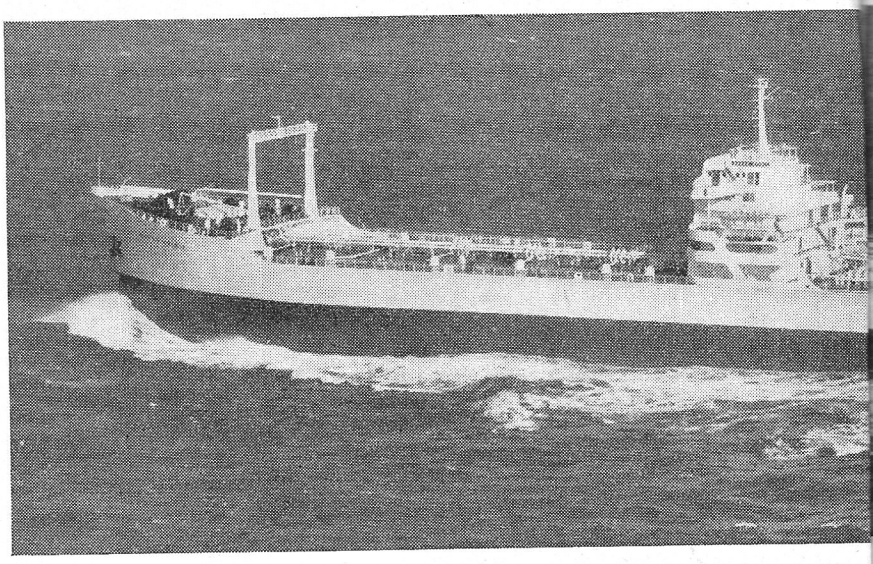
To say the least, her dimensions are impressive: she has an overall length of 848 ft, a maximum beam of 108 ft and her cargo tank capacity is 3,034,999 cu. ft. Her propelling machinery consists of steam turbines developing 20,900 shaft horse power, giving her a loaded speed of just over 16 knots on a fuel consumption of 100 tons of oil daily. Accommodation and amenities for the crew are of an extremely high standard and include a swimming pool, cinema and library.

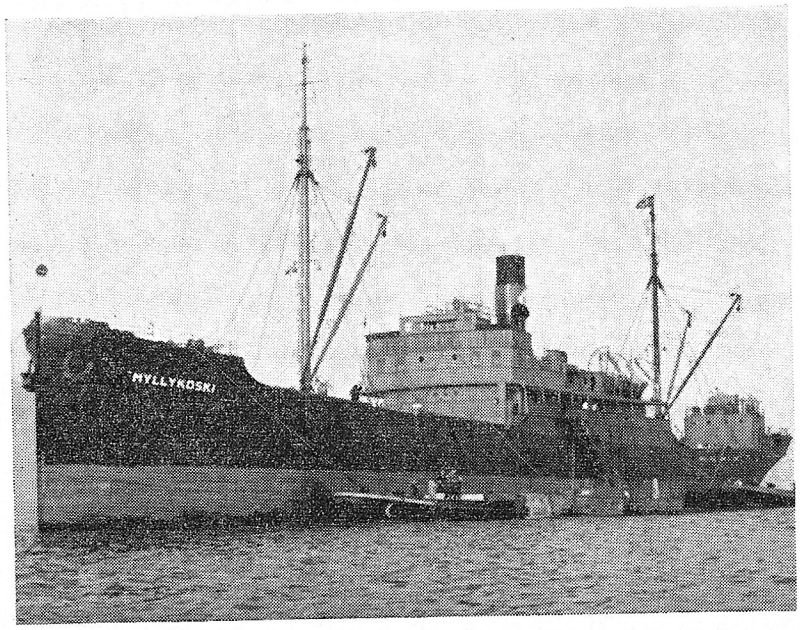
The *Naess Spirit's* master is Capt. R. Richards of Glasgow, who joined her in April this year, after having commanded other ships of the Naess fleet. The chief engineer is Mr E. J. Minton of Gourock.

The International Naess group, founded by Norwegian-born Erling D. Naess, operates several even larger tankers, among them the *Naess Sovereign* and *Naess Champion*, 54,700 tons gross, both of which were built in Japan.

A record holder of a very different kind is the Spanish steamer *Enrique Maynes* of Valencia, which I believe is the oldest British-built freighter still in commission. The *Enrique Maynes* was built by J. Readhead and Company at South Shields in 1875 under the name *Sagunto*, and has apparently traded mainly in the Mediterranean ever since. She is an iron-hulled vessel of 956 tons gross, powered by her original Readhead compound two-cylinder steam engine, which now uses oil fuel.

While this fine old ship owned by Senor Francesco Merelo-Barbera of Madrid is unlikely to be seen in British ports, two Finnish veterans





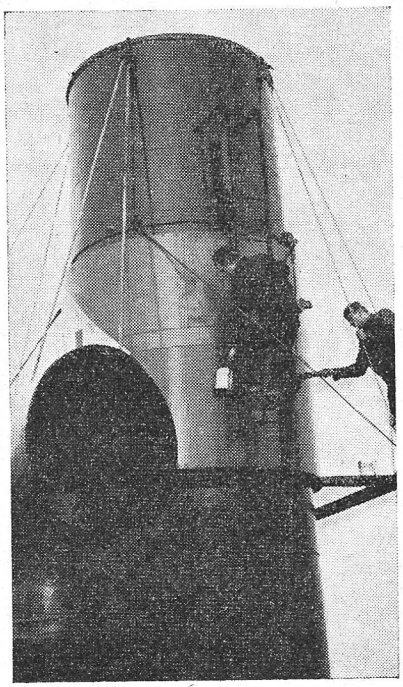
Above: British super tanker NAESS SPIRIT *of* 41,327 *tons gross. (By courtesy of Skyfotos.) Left: The* MYLLYKOSKI *discharging cargo off Greenhithe. Below: Two of the crew painting* MYLLYKOSKI'S *funnel*

are very familiar here—the *Nina*, 2,070 tons gross, and the *Myllykoski*, 2,770 tons gross, built in 1899 and 1909. They are owned and operated by R. Nordstrom and Company of Lovisa, and normally trade from such Gulf of Finland ports as Kotka and Hamina to the Thames, Medway or Preston.

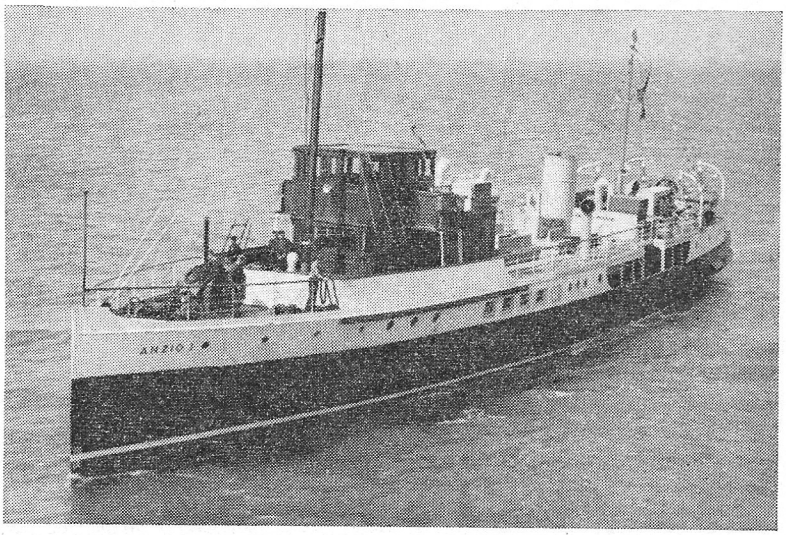
The *Nina* is a typical small three-islander, built in the A.G. Neptun yard, Rostock, as the *Martha Russ* for Ernst Russ of Hamburg. Her dimensions are: length overall 281 ft 5 in., beam 40 ft 6 in. and Summer draft 18 ft 3 in. Her steam triple expansion engines develop 168 n.h.p. and her loaded speed is about $7\frac{1}{2}$ knots.

The *Myllykoski*, which is similar in hull form, has a graceful counter stern and a single tall, unraked funnel of the type common in ships of her period. She has a length of 336 ft, a beam of 45 ft and Summer draft of 18 ft $4\frac{1}{2}$ in.

When I visited her in the Medway off Chatham, where she was discharging wood pulp for a local paper mill, I was told by her chief engineer that her original triple-expansion engines were in remarkably good condition, still giving her a loaded speed of over 8 knots.



The *Myllykoski* was a product of the famous Bremer Vulkan yard at Vegesack and was laid down to the order of Hugo Stinnes of Mulheim, who named her *Adeline Hugo Stinnes 3*—for some reason all this owner's ships carried a company number as part of their registered names. After passing through various German and Belgian hands, she was acquired by Nordstroms in 1933. At present she has a crew of 29 and is commanded by Capt. J. Soderblom, brother of the *Nina's* master.



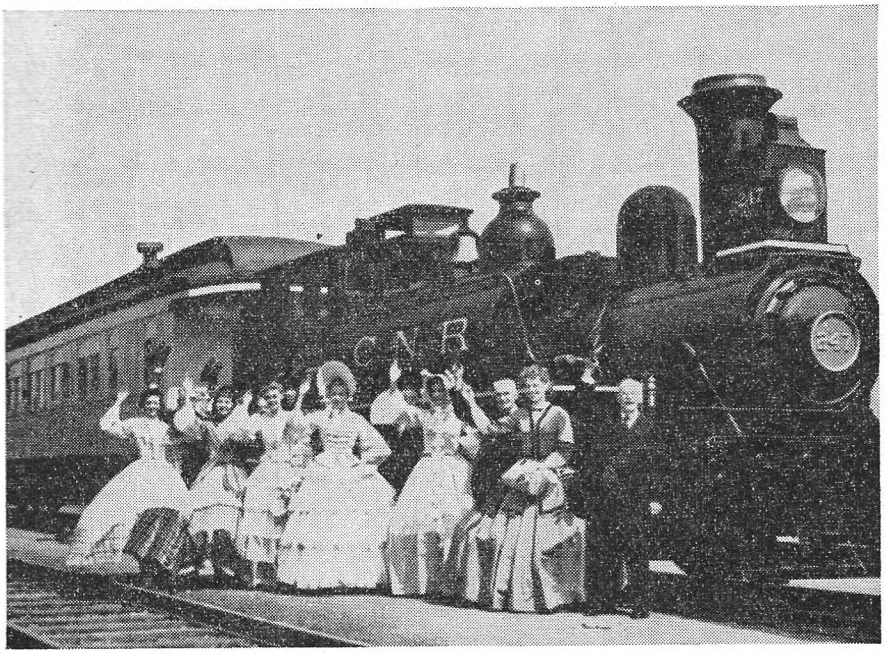
Right: ANZIO I (*the ex*-LOCHINVAR) *arriving at Southend on her first trip of* 1962. *Below: Capt. Jack Matthews on the bridge of* ANZIO

Beginning as a small family business at Lovisa between the Wars, the Nordstrom Company—officially A/B R. Nordstrom and Company O/Y—now owns a fleet including modern tankers and cargo liners. The liners operate the Norlake Line to the Great Lakes; the older units work mainly in the wood pulp trade and can often be seen at Greenhithe or Rochester buoys discharging with their own derricks into lighters alongside.

Thirty years is a fair life-span for any hard-worked passenger ship, but the 216-ton *Anzio I* of London is well on her way to double that figure. As the *Lochinvar*, she was designed for David MacBrayne's West Highland mail route from Oban to Tobermory via the Sound of Mull, where she served for nearly half a century.

The *Lochinvar* was built on the Clyde by Scott and Sons of Bowling in 1908. She has an overall length of 152 ft 6 in., a beam of 24 ft 1 in., and a draft of 6 ft 8 in. As first brought out, she was powered by three six-cylinder paraffin engines and was one of the first triple-screw motor vessels in England. She was re-engined in 1926 with a conventional diesel. Her present machinery,

● *Continued on page* 250



Those were the days! The engine in the background has anyone noticed it?—is a Wallace 0-6-0 of 1894 (CNR picture)

Now and then the CNR sends out a travelling record of the past when the railroads were building a nation

CANADA LOOKS BACK TO STEAM

Continued from August 9, page 168

MUSEUM TRAIN

THE Canadian National Railway operates a Museum Train—three locomotives and six coaches—which leaves Montreal at infrequent intervals.

The train records much of the history of the CNR and its predecessors, particularly the Grand Trunk Railway. It was on 27 October 1856 that a wood-burning locomotive and seven cars of the Grand Trunk Railway left Montreal for the historic trip to Toronto. Another train left Toronto for Montreal at the same time. Their arrivals 15 hours later marked the inauguration of the through-service. Dignitaries aboard the trains, and the peoples of both cities, hailed the railroad for its tremendous contribution to Canada's growth and increasing prosperity.

Memories of these early days are preserved throughout the Museum Train. The three engines and the oldest of the six cars were all built for the Grand Trunk Railway.

First in line is No 713, a Mogul with a 2-6-0 wheel arrangement. She was built in 1900 at the Grand Trunk Railway's shops at Montreal, and long afterwards was taken out of regular switching service at the Turcot Yards in Montreal to roll with the Museum Train. The Moguls were heavy main-line freight haulers, and No 713 has their typical low driving wheels and chunky appearance.

No 40, the oldest and most handsome of the locomotives, dates from 1872. This high-stacked engine was built by the Portland Company at Portland, Maine, and is the last Portland locomotive known to exist. She was the first to be built for the Grand Trunk after it had converted its track from broad gauge, 5 ft 6 in., to the standard 4 ft 8½ in.

The Atlantic and St Lawrence and the main lines of the Grand Trunk were built to a 5 ft 6 in. gauge, but the railroads in the United States adopted the English gauge of 4 ft 8½ in., which was also favoured by a number of other railroads in Canada, notably the Great Western. These differences made interchange of rail traffic—the transfer from the lines of one company to those of another—expensive and awkward. At some points a third rail was used to standardise the gauge, and at others the bodies of cars were lifted off their wheel trucks for transfer to trucks of the narrower, or wider, gauge of the interchange line. At one time four rails on a single track line into Toronto provided for three different gauges.

In 1873 the Grand Trunk decided that it would adopt standard gauge between Stratford, Ontario, and Montreal. The line was changed from 5 ft 6 in. to 4 ft 8½ in. on October 3 and 4, with very little interruption to traffic. East of Montreal the gauge was changed in 1874.

When the Grand Trunk was double-tracked between Montreal and Toronto, the English system of running to the left was adopted. Left-hand operation continued until 1906.

The Prince Edward Island railways were built to narrow-gauge and were not converted to standard until about 1918. Lines in Newfoundland are still narrow-gauge.

Old No 40 has another claim to fame. In an era when passengers would get out and help the crew load logs to feed the wood-burning engine, No 40 was built as a coal-burner. Then, when other locomotives were being converted to coal, No 40 insisted on burning wood.

She was designed as a fast passenger engine and originally had four

66 in. driving wheels. With the tender, she is 52 ft long and weighs 38 tons. The last of the Canadian main-line steam locomotives weighed, on an average, more than 300 tons.

The records do not show when No 40 was re-converted to coal. In 1903 she was sold to the John Breakney Company for the Chaudiere Valley Railway, a lumber line. She was promptly reconverted to burn wood, thus completing the cycle for the second time! Somewhere in her history her 66 in. drivers were replaced by 60 in. wheels for freight service.

Of the three engines in the Museum Train the smallest and oddest is No 247, a Wallace 0-6-0 switcher with a saddle-tank straddling the boiler. The coal supply in this 1894 locomotive was carried in the engine itself, eliminating the need for a tender and producing a compact unit for yard switching—but one which lost efficiency through its low water and coal capacity.

No 247 was built at the Grand Trunk's Montreal shops and was the last of its type to be constructed there. She was found partly buried in a sand pit near Belleville in Ontario, where she had lain abandoned for many years. After a flat car had taken her to Montreal, she was given a complete face-lift before being put into service with the Museum Train.

"Varnish boxes" and "snoozers," as the first coaches and sleepers were called, have been carefully reconditioned. The oldest unit is CN 59262, a day coach. It was built at the Grand Trunk Railway's shops at Montreal in 1859, only 23 years after trains started rolling on Canada's first railway, the Champlain and St Lawrence.

In 1900, the coach became a Grand Trunk boarding car. It was given its present number, and placed in service on the Portland (Maine) Division as an auxiliary boarding car, in July 1924.

The second oldest unit in the train is CN 7108, a combination baggage and passenger car now carrying exhibits. It was built in 1866 by the Nova Scotia Railway, and after becoming Intercolonial Railway property was rebuilt in May 1901 as a second-class passenger and baggage vehicle. Under the Canadian Government Railways, it was twice renumbered and was upgraded to a first-class car. After the CNR was formed to succeed the CGR it moved West and received its present number in 1919 at the Transcona shops near Winnipeg. It was taken out of mixed service in Alberta for use in the Museum Train.

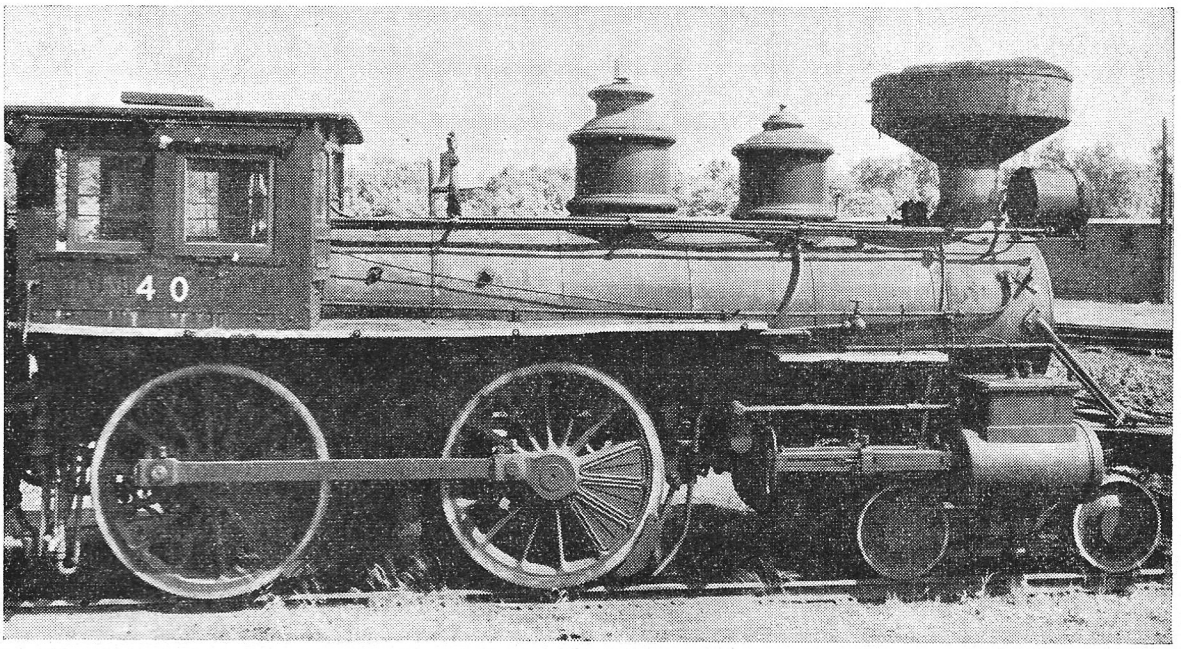
The dining car, CN No 4006, was built by the Wagner Palace Car Company in May, 1899, for the Intercolonial Railway. In 1916 it beacame Canadian Government property, and the CNR renumbered it at Moncton in 1920. Besides serving in the Maritimes, it also rolled up plenty of milage in southern Ontario, on the St Lawrence Division between Montreal and Ste Hyacinthe, and in the Levis District.

Sleeping car CN 2541 was built in 1904 as a second-class sleeper, or colonist car, for the Intercolonial Railway and was rebuilt in 1910 as No 531. It became the Canadian Government Railways No 1531 in 1916, and was renumbered CN 2541 at Moncton three years later. It also saw extensive service on the prairies.

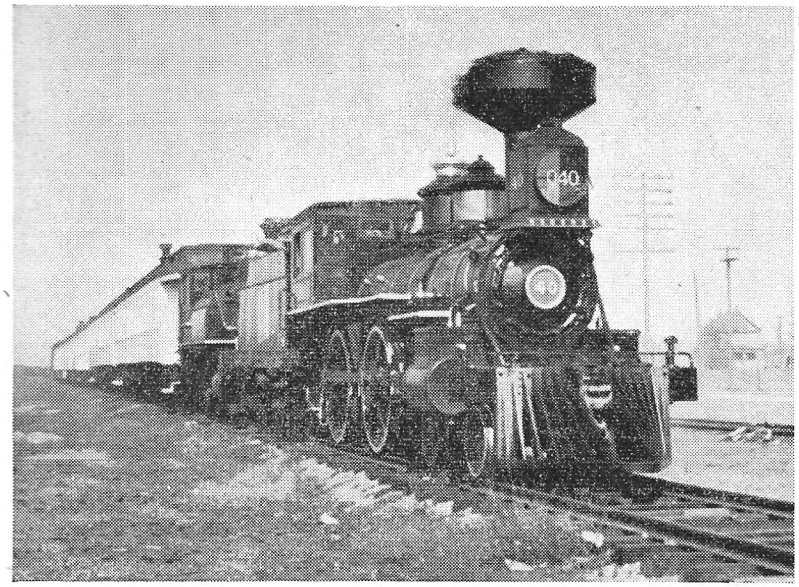
Two cars built by the long-defunct Harris Car Company at Saint John, New Brunswick, carry historical displays. The units originated as day coaches.

CN 8108, the older of the two, dates from 1875. The other, CN 8029, was built two years later. Both were made for the Intercolonial Railway, which converted them to baggage cars in the Nineties.

They became CGR property in 1916, and received their present CNR road numbers in 1920. No 8029 was taken out of service between Moncton and Pt du Chene,



CNR No 40 was a coal-burner when other engines were using wood, and a wood-burner when others were using coal. After being converted to coal, she was made into a wood-burner again



Clear the line for No 40! Surely she has steamed straight out of a drawing by Currier and Ives?

New Brunswick, to join the Muesum Train, while No 8108 had been in service in Halifax until the train was marshalled.

Old tickets, timetables, posters, lanterns, menus, photographs, sections of rail, telegraph equipment, and other exhibits help to preserve the lore of the early railroading days in Canada. Special sections are devoted to pioneer steamships, motive power, and so forth.

One exhibit is the diesel engine which powered the diesel rail car that broke all records on a cross-continental trip. The car, CNR No 15820, left Montreal on 1 November 1925 and arrived at Vancouver, 2,937 miles away, in 67 hours.

From time to time during the course of Canadian history, members of royalty have made official vists to Canada and caused a flurry among railwaymen. There are pictures and memorabilia aboard the Museum Train of royal tours from 1860 to 1951. The earliest royal visitor was the future Edward VII who, as a boy of 18, opened the railway bridge across the St Lawrence at Montreal and laid the corner-stone for Parliament House before he crossed into the United States to visit President Buchanan.

Included in the collection are special train notices of the Grand Trunk, Canadian Government Railways and the International covering the movement of the royal train which carried the Duke and Duchess of Cornwall, later King George V and Queen Mary, in 1901. Annotated timetables provided for the visits of the Prince of Wales, now Duke of Windsor, in 1919; of Prince Arthur of Connaught in 1906; and of King George VI and Queen Elizabeth in 1939.

The visit of the Prince of Wales in 1861 is well covered. A picture of the royal train shows what was probably the first railway sleeper in Canada. The Prince used it on his journey. It was built in Hamilton by the Great Western Railway, now a part of the Canadian National system.

The Prince's coat-of-arms on the 1861 train may be seen in a collection of metal reproductions of royal coats-of-arms used on trains from 1861 to 1939.

We are shown a leatherbound copy of the photograph album presented to King George VI and Queen Elizabeth in 1939 to commemorate their visit to Jasper Park Lodge in the Canadian Rockies. The original dining car meal checks signed by Queen Elizabeth and the Duke of Edinburgh are mementoes of a royal visit in 1951.

● *This ends the three-part article by Henry McDougall of Erindale, Ontario. The first part was published on July* 26 (*page* 99) *and the second on August* 9 (*page* 166).

HERZOGIN CECILIE . . .

Continued from page 236

model quite safely, by holding the tiny handrail.

The hatch covers, winches, and other fittings, were straightforward modelling tasks in wood. Each of the three anchors was made from four pieces of copper soft soldered together, with a minimum of solder. With the anchor chains, windlass and capstans they were painted matt black.

I fashioned the fife rails at the foot of the masts from teak. They were strongly fixed to the deck, as they take a surprising amount of strain, because they hold so much running rigging.

I carved the figurehead, the Duchess herself, from an old kitchen knife handle. The ivorine handle carved easily.

The model has dual wheels for steering astern, and another pair amidships, where the steering was done in the original ship.

I produced the wheels from thin brass wire, shaped into rings, with the spokes soft soldered to them. The work was gently pressed in the vice, to make the spokes sit tighter.

The hull is painted off-white, with Indian red below the water line, and the boot topping separating the two colours is a bright green. A mid-grey line runs round the hull at a level with the main deck. The small boats, davits and deck houses, are white and ventilators are white with sky-blue inside the mouth of the vent. Yards, masts and bowsprit are buff, except on the masts where the sliding yards are; there it is black. The colours combine well.

The model cost me very little to make. Almost everything needed will be found in the average modeller's workshop.

I do not regret any of the 12 months' spare time it took me to make *Herzogin Cecilie*, a ship which served her masters well for 34 years before she was lost in 1936. ◘

DIESEL FROM A MOPED UNIT

This 7¼ in engine runs well but has not made R. W. FENWICK less loyal to steam

HAVING been given a Cyclemaster 25 c.c. petrol engine, I wondered if it could be used as a power unit for a locomotive. After much scheming, I felt that it would not be suitable owing to its shape. Later I bought a second-hand Paloma 50 c.c. two-stroke engine which had been in a moped and seemed likelier to suit my purpose.

I decided to base the general outline of my engine on the BR standard 0-6-0 diesel shunter. Its length would just allow me to take it by car to the track, and I did not have to work out a transmission system as for a bogie locomotive.

After buying the power unit, I got a small Skinley O gauge drawing for the external shape and details. Then the engine just grew up round the power unit.

The mainframe

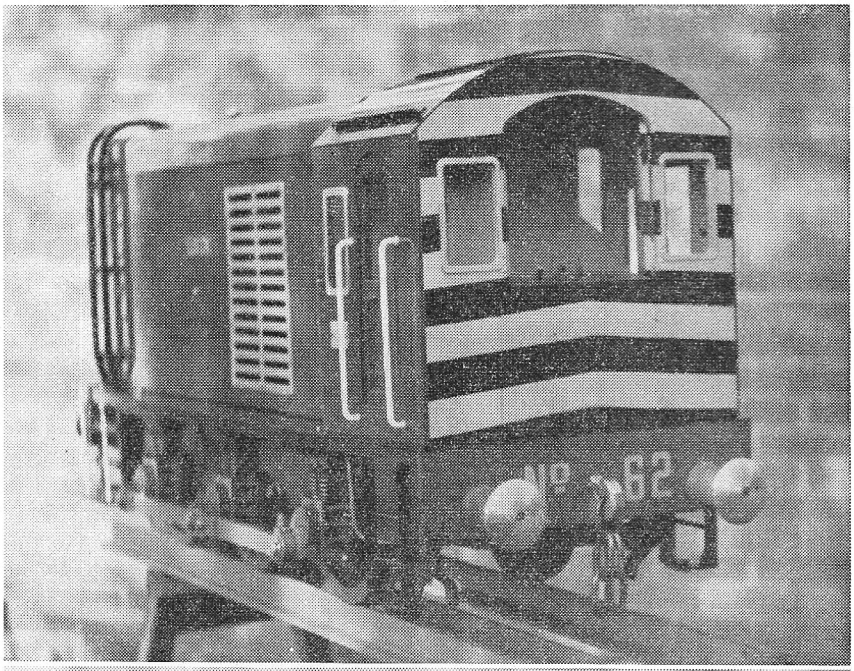
I made the frames from $\frac{3}{16}$ in. black iron and the buffer beams from ¼ in. × 3 in. angle iron. When the frames had been finished to shape, they were arc-welded to the beams. The power unit had been stripped and serviced, and was fixed on the frames, complete with its own silencer, by its original mountings.

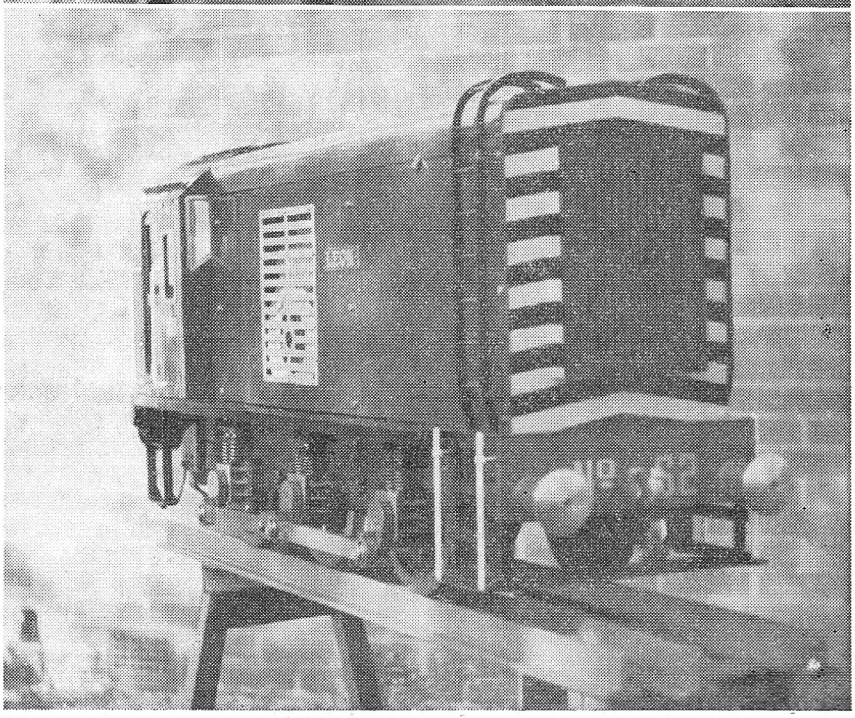
The Paloma has an automatic clutch which is adjustable. As units of this kind drive Go Karts without a gearbox, I thought that I would dispense with one and drive on the throttle. But I needed a means of reversing, and so I got some sprocket wheels and arranged them on a sheet of paper until, in theory, I had one wheel turning clockwise and the other anti-clockwise.

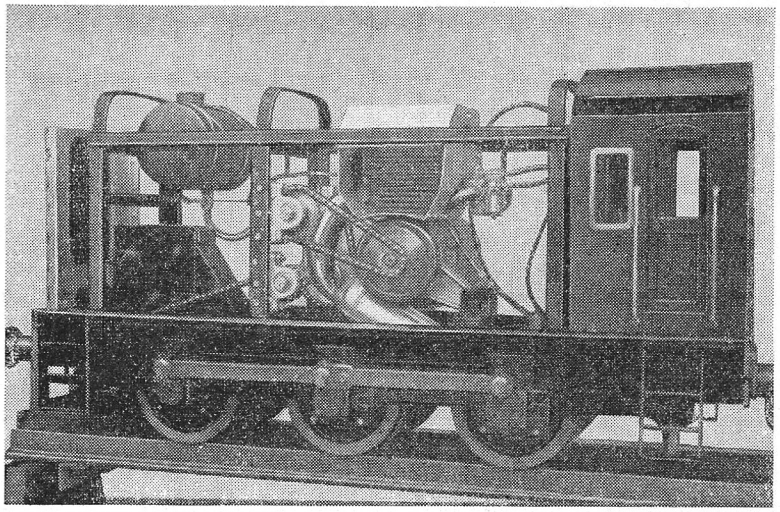
Reversing gearbox

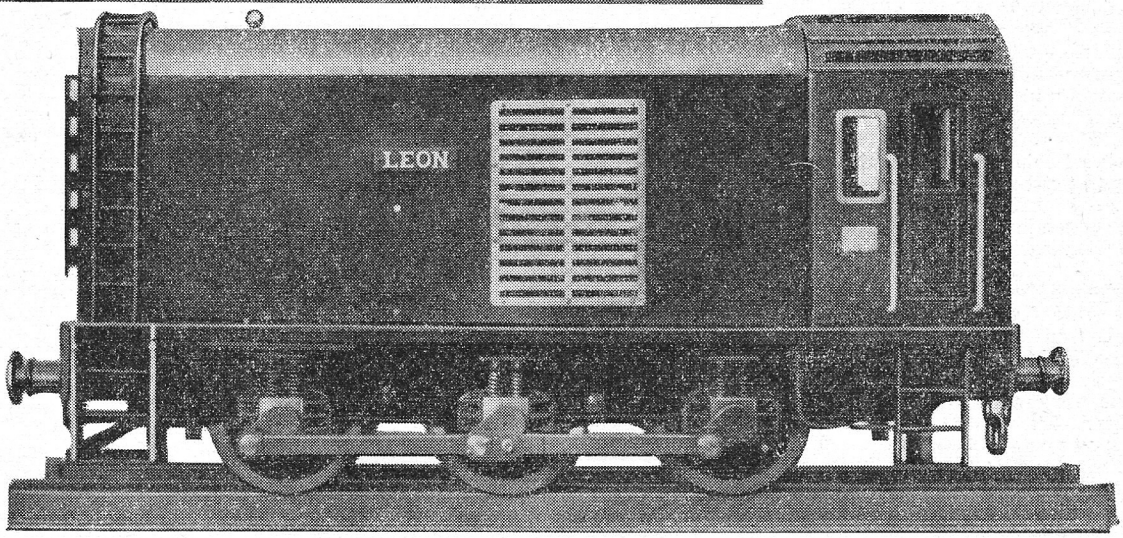
Using this layout, I built the sprockets into a reverse gearbox. The power unit drove them, and the final drive was by a dog clutch engaging on one of the clockwise or anti-clockwise turning sprockets, then through two countershafts, and finally on to the centre driving axle. There was a reduction of about 10-1. The gearbox was sealed so as to provide an oil bath, and provision was made for chain adjustment.

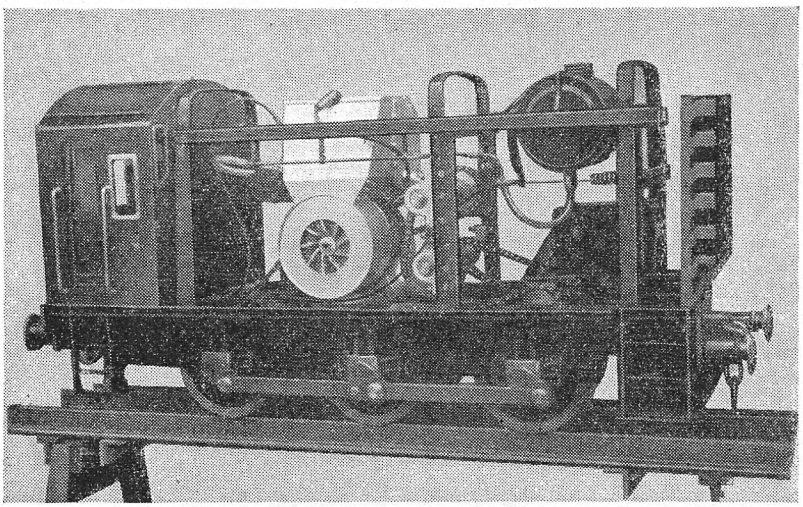
With the frames, power unit and reverse gearbox assembled, my next











Wonderful the works of a wheelbarrow

step was to make the axleboxes. I used cast iron blocks produced by Stuart Turner to my pattern. When they had been machined all over, a $\frac{1}{8}$ in. brass plate slightly larger than the overall width was screwed to one side to form the inner flange. I then bored them to take the axles, which were $1\frac{1}{8}$ in. mild steel. The horn plates and spring hangers were prefabricated from $\frac{1}{8}$ in. $\times$ 1 in. steel angle iron.

Tensioning the springs

I could adjust the spring tension by screwing down on the spring cups and using a lock-nut. A frame of angle iron built up from the frames carried the engine casing sides and roof, and other fittings—including the fuel tank, made out of a snuff tin with its lid and sides resoldered, and a push-pull fuel tap operated by Bowden wire from the cab. A breather from the fuel tank was led outside the engine casing.

As I wanted the control panel for the cab to be as simple as possible, I arranged a signal lever frame from either side of the main frames and mounted the estimated number of control levers required—fuel, choke, throttle, brake, air pump, whistle, reverse and cut-out. The levers slide up and down on their pivot rod under spring control. A peg fitted to them engages in notches cut in the underside of each lever quadrant. By pushing down on the levers, moving them, and then releasing them for the peg to engage, I get a fine movement control. The levers are connected to the fittings by Bowden wire and home-made adjusters.

As this power unit requires cooling, I obtained a vacuum cleaner fan, enlarged the blades, and fitted it on to the flywheel with a slotted bush on the main shaft. I then made a thin iron trunking and placed it round the fan and cylinder head.

My starting device is a notched pulley running free on a shaft. It has a tongue on one side. To start the engine I coil a cord round the pulley, insert the tongue into the slotted bush, and pull the cord.

Driving wheels

I had difficulty in getting wheels. In the end I obtained some 6 in. dia. disc-wheel castings from Wilwaugh. They were a press-fit and were fixed by grub screws through the boss and axle.

The cranks, made from ½ in. steel plate, were also secured by grub screws. I hand-sawed the coupling rods from 1½ in. × ½ in. steel plate. A moped internal-expanding cable brake is fitted to each centre driving wheel.

The engine casing sides and roof are of sheet dural with ventilation grills cut out, and the cab is of plywood with two doors in the back so that the controls can be reached. Valspar green and black paint provide the finish.

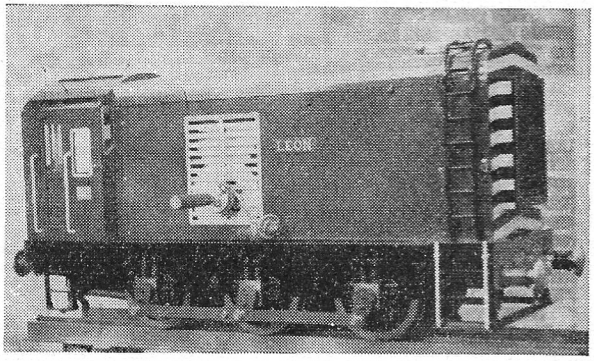
Blowing the whistle was rather a problem. I solved it by placing two air reservoirs under the front buffer beam. They are fed by a small hand pump. The reservoirs then supply the whistle through a valve.

Before the engine could be taken to the track, I had to make a collapsible trolley to move it from the storage shed into the car, and then out of the car and on to the rails. To hold it in the car I built a cradle.

The first outing

The locomotive was given its first run in heavy rain. Apart from stopping when water got into the fuel, it seemed to be capable of useful work. On the following day I took it on to the ground-level track of the Malden Society for a thorough test. Its performance pleased me very much; it even hauled some of the track-day passengers.

Towards the end of the ten months that I worked on the engine, I began to wonder if I was wasting my time by using such a small power unit with no gearbox. But the second test dispelled my fears. I must admit that I do not get the same thrill out of driving this engine as I do from one of my steam locomotives, for all I have to do is open and close the throttle. And so I remain a steam enthusiast. ▣



Pull the cord and it starts

SCOTT'S GEAR MOULDER

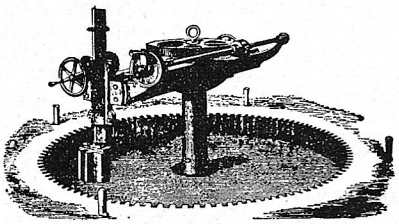
GEAR wheels have been with us for centuries. The early ones were wooden pegs projecting from the circumference of a drum and engaging a similar drum, or a pinion of the lantern or trundle type.

We are told that John Rennie, the bridge-builder, was the first to use cast-iron for spur and bevel wheels. A Manchester foundry advertised in 1814 a wide range of gears. Patterns were made from "dry mahogany." Cast-iron wheels with wooden cogs or teeth mortised into their rims were preceded by the modern hide gears. They used the good shock-absorbing qualities of the wood forming the teeth.

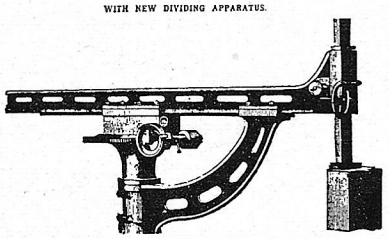
Various jig devices were employed to finish off the teeth profiles and to cast the wheels in the first place. Jackson and Brother Limited of Bolton brought out a moulding appliance for spur and bevel gears. Instead of a complete pattern of a gear wheel, the J. C. Scott machine of 1860 had a pattern for two or three teeth only. It was attached to a radial arm, which was rotated step by step until the mould was completed. The original working drawings are still in the files of the makers. Does any reader know if one of the Scott machines can still be found?

A. W. NEAL.

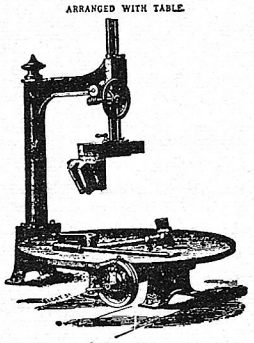
OLD WHEEL-MOULDING MACHINE,
WITH NEW DIVIDING APPARATUS



NEW WHEEL-MOULDING MACHINE,
WITH NEW DIVIDING APPARATUS.



SMALLEST SIZE OF MOULDING MACHINE.
ARRANGED WITH TABLE.



Illustrations reproduced from a 19th century catalogue of the firm

WE REGRET . . .

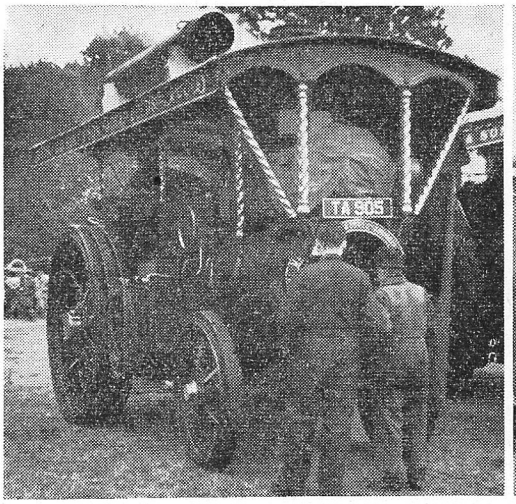
Our guardian angels forsook us when we went to press with Mr Arthur W. Smith's article Downthrust on the rails *in ME for June 28. The table of results came adrift from the copy and its absence was discovered too late for us to repair it in that issue. Then, when we published the table in ME for July 19, a typing error made us refer in mildly Wellsian style, to July 28. We await with interest Mr Smith's comments from Lisbon! Meanwhile we send him our apology.*

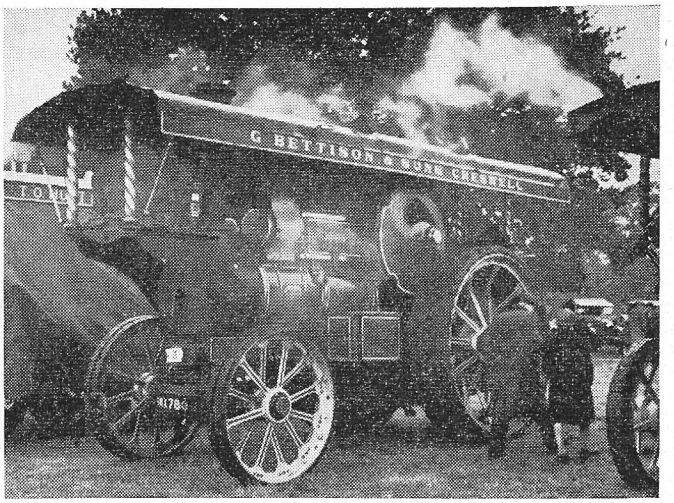
Rempstone had rain

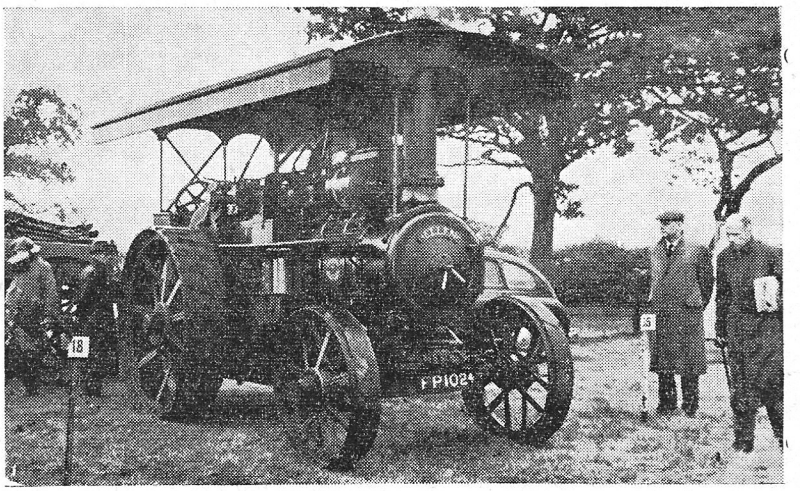
It was "Hot dogs all round" when the traction engine lovers met in a steady torrent near Loughborough

By MICHAEL WOOD

C. T. Dabell, owner of the 1917 *Ransomes Sims and Jefferies No* 27014, *finds his pipe a comfort. During its early life the engine was used for forestry work in Wales; hence the* CAMBRIAN. *Mr Dabell is from Gotham, the village in Notts.*

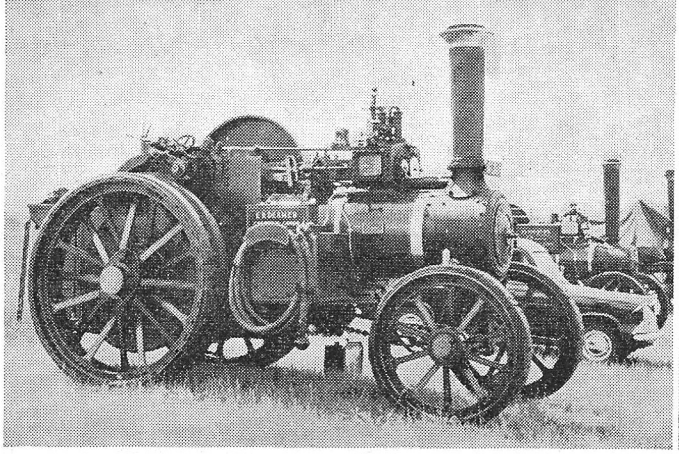


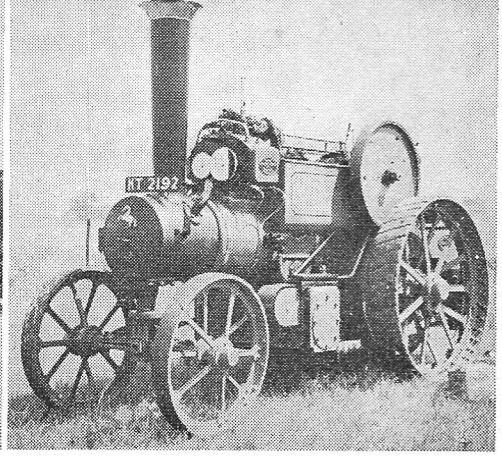




Above, left: "She wasn't always a showman's engine, you know." Two enthusiasts discuss the conversion of this Burrell 5 n.h.p. engine by T. O. Hunt of Leeds. She is called the MARSHAL FOCH; *during the war, when she worked on demolition in Southampton, she was known as* PRIDE OF DEVONSHIRE. *She is No* 3949 *of* 1921. *Above, right:* HEADWAY, *the Fowler* 15117 8 *n.h.p. of* 1920, *was used till* 1946 *on fairgrounds. Purchased in* 1949 *by G. A. Bettison, Creswell, she was originally owned by J. Drury and son, Laceby, a village near Grimsby*

Right: From Old Balby C. Price brought his 7 *n.h.p. Allchin* 1108 *of* 1890. *It had worked around Oakham. The rally was held at Stanford, a little village close to Loughborough*



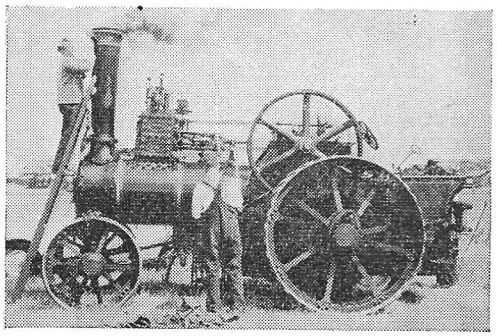


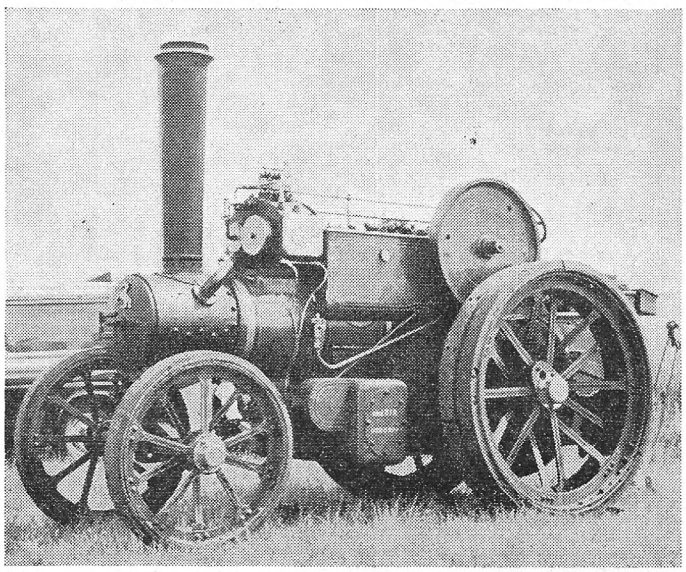
AROUND THE RALLIES—2

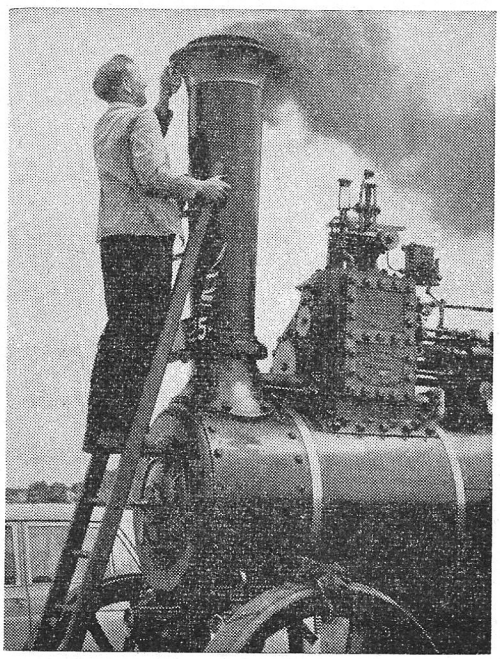
Left: E. R. Deamer of Chatteris, Cambridgeshire, owns this Burrell 5 n.h.p. road locomotive built for a timber merchant at Norwich in 1927 and numbered 4066. Right: This little Aveling and Porter tractor stood on a scrap heap for 20 years before rescue came. She is the 4 n.h.p. 8288 of 1914 owned by T. B. Paisley, Holywell

ALL TOGETHER AT PARADISE FARM

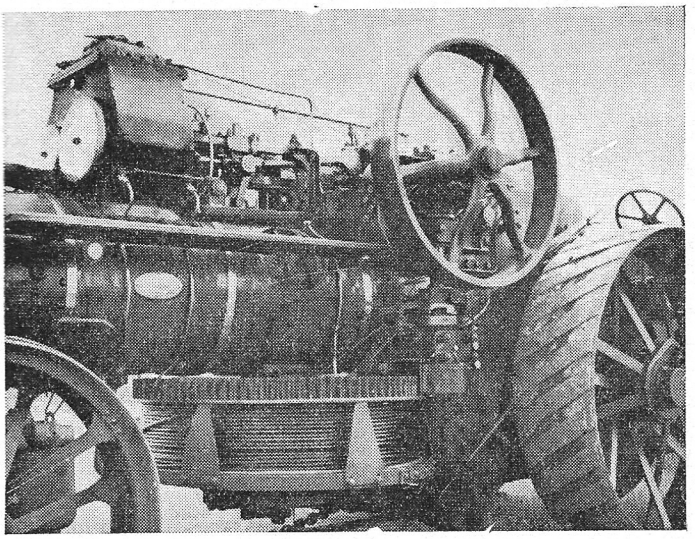
This Ely meeting, photographed by BRIAN WESTERN, was arranged to help the Friends of Tower and St John's Hospital in providing comforts for the very sick. Their main objective for 1962 is a sun-lounge

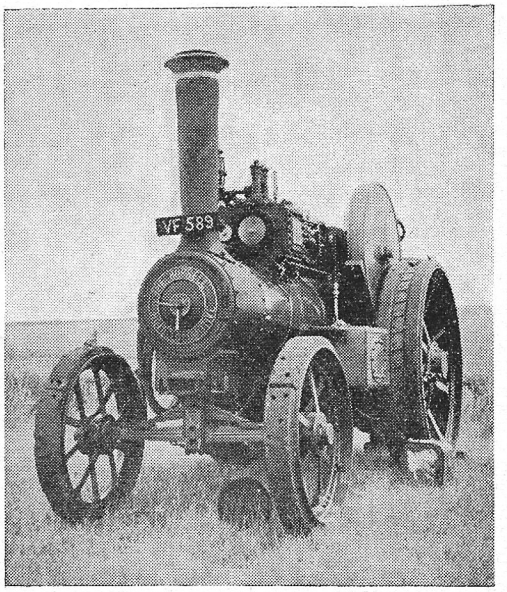






Above: Aveling and Porter mounted on rubbers—the 4 n.h.p. d.c.c. tractor owned by E. R. Deamer of Chatteris and built in 1911 when she went to a contractor in Glasgow. She is 8809 Right: J. Covill and G. Nicholls of Cheveley, Cambridgeshire, use spit and polish on a 6 n.h.p. Burrell built in 1902 and shown at the Bath and West in that year. H. Nicholls bought her in 1950 Right, top: Burnished copper. One can almost smell the smoke





Left: Part of the machinery for driving the winch on the massive 16 *n.h.p. Fowler ploughing engine* 14384 *of* 1921. *She belonged to John Patton of Little Hadham and is now owned by Jack Branch, Waterbeach*
Right: Another view of the fine 5 *n.h.p. Burrell owned by E. R. Deamer of Chatteris, Cambridgeshire*

GOOD FOR THE LIVER

BEFORE 1912 visitors to the village of Igls in the Austrian Tyrol had to make the journey from Innsbruck by cab. This was a slow business as Igls lies in a mountain valley high above Innsbruck, and the road is a steep one. It is only about five kilometres by road, but even the best of cab horses had to walk most of the way, with frequent rests.

Going down was faster, but stops had to be made to let the brake shoe of the cab cool down. The shoe consisted of a block of wood, usually beech, applied through brake lever and quadrant to the iron tyre of the vehicle. Going down, the friction of the wood on the metal generated a good deal of heat and sometimes resulted in a fire if the cabman was in a hurry.

In 1911 it was decided to build a light railway to Igls. The Mittelgebergsbahn was completed in 1912. It was rather longer than the five kilometres by road, as the grades were not so steep. Had the grades been steeper, the little locomotive, despite its trouser button wheels, would hardly have made it. The line was anything but straight. Curves, some of them very sharp, occurred every hundred yards or so. For this reason, the coaches were made very short, about one-third the length of the average Austrian four-wheeled coach of the period.

The whole outfit must have looked very picturesque as it puffed its way up to Igls. It continued to puff until 1936, when the line was electrified.

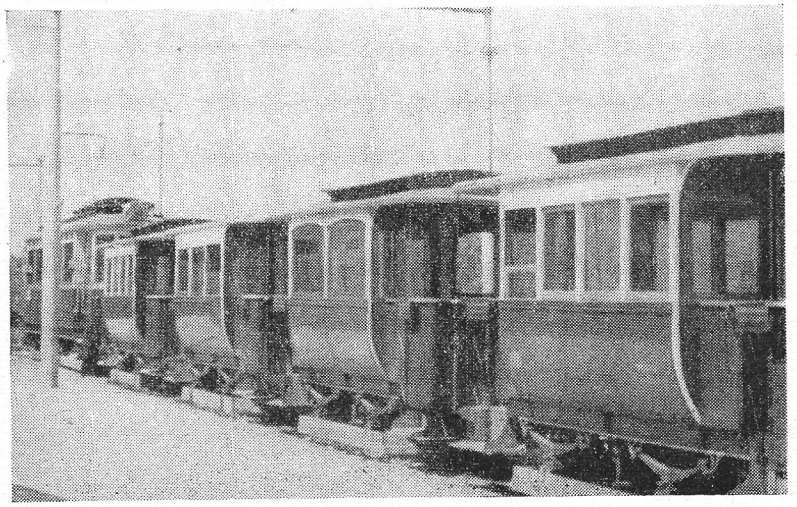
When electrification was completed, the locomotive and coaches were discarded and the normal single-decked tram took their place, much to the disappointment of regular visitors to Igls.

The place became popular as a mountain resort, and as the tram could not cope with the increased passenger traffic the little coaches were refurbished, repainted, and brought into service again, hooked on to the back of the tram. They have proved highly popular ever since.

A ride down to Innsbruck on the end coach is an experience never to be forgotten. One feels like a fish on the end of a line, though the ride is said to be beneficial to the liver.

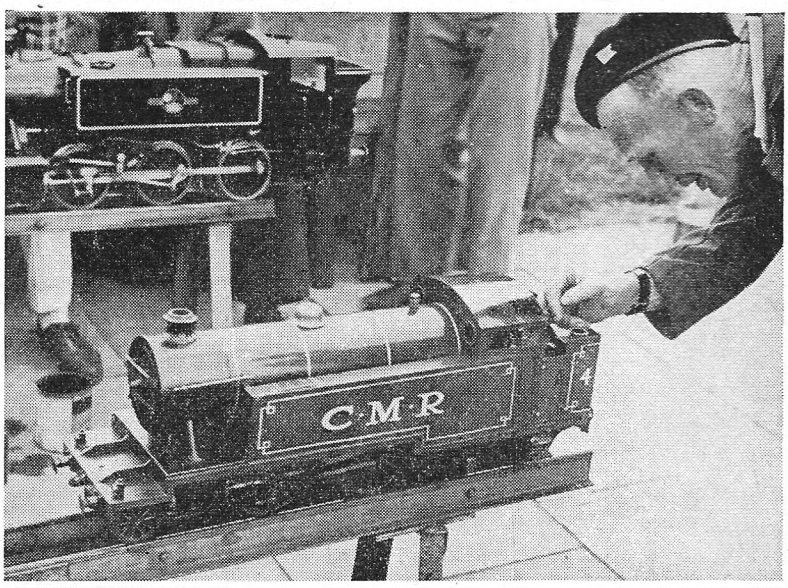
The picture shows the tram and four coaches at Igls station. ▣

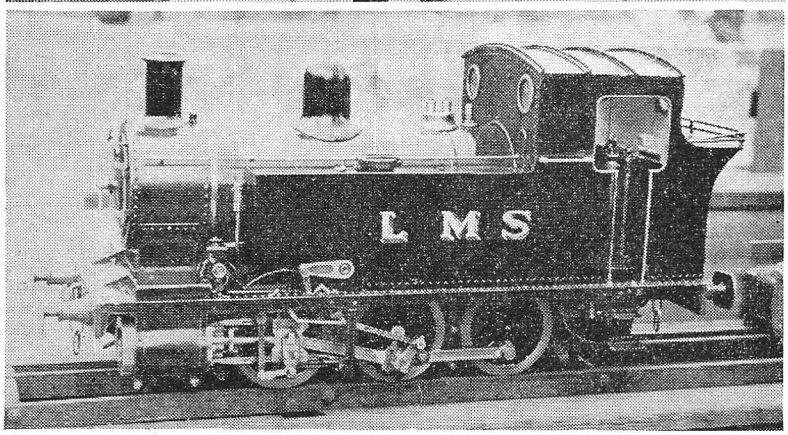
MANNING COLES.



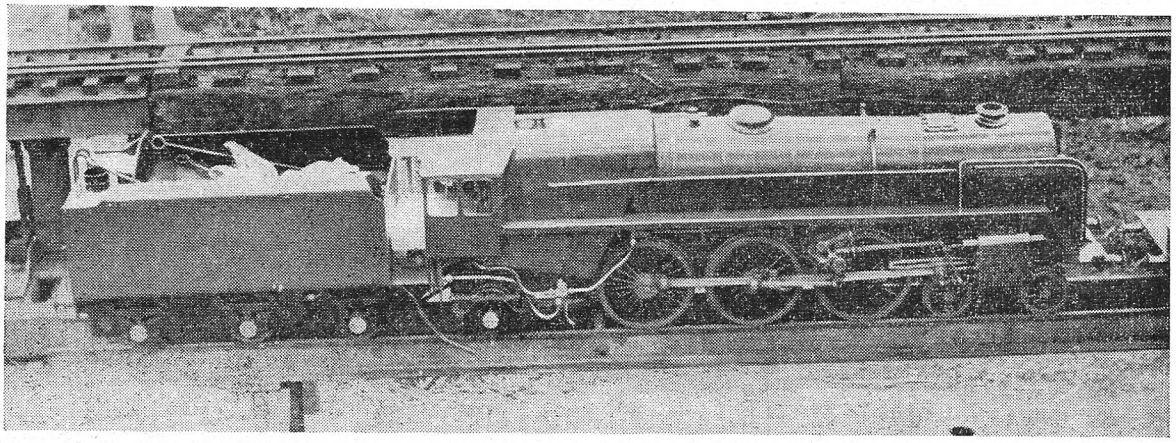
BRIGHOUSE HOLDS A CLUB DAY

W. J. HUGHES TAKES HIS CAMERA TO A STEAM EVENT IN YORKSHIRE

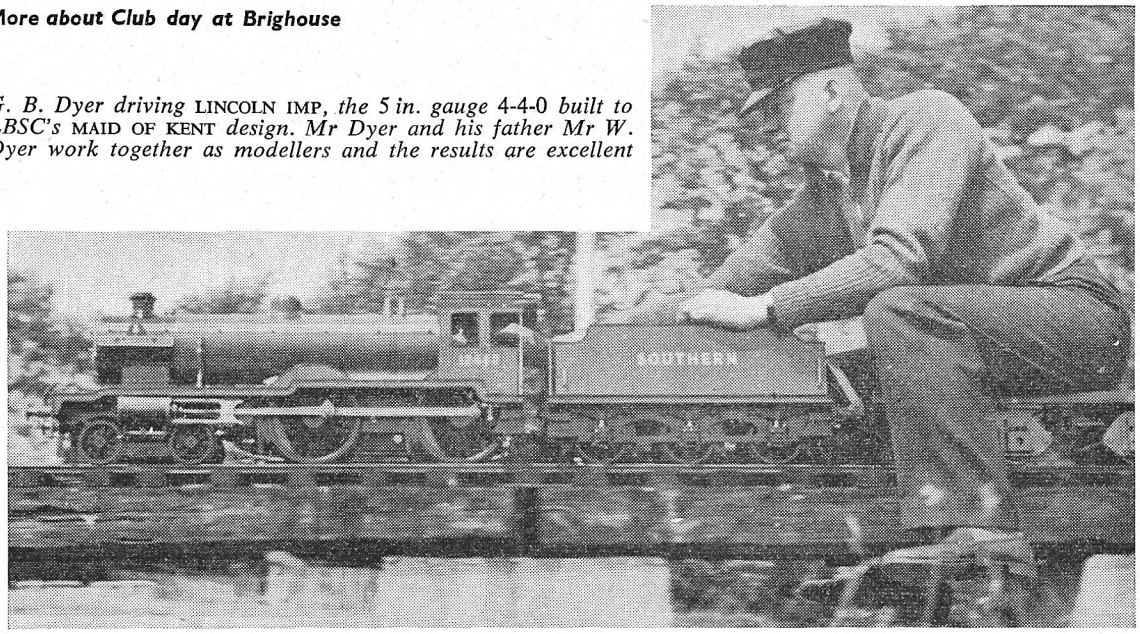




Top: This engine by Alfred Cracknell of Sunderland is a 2-4-4 *with a Weir donkey pump in the coal bunker. Bert Stamp, another member, is steaming her. Right: Harold Williams' dock shunter* TWIN SISTERS *has been used for* 11 *years*



Hauler from Urmston—the 3½ *in. gauge* BRITANNIA *by Sydney Rowland. She will pull as many as* 18 *children*



G. B. Dyer driving LINCOLN IMP, *the 5 in. gauge 4-4-0 built to LBSC's* MAID OF KENT *design. Mr Dyer and his father Mr W. Dyer work together as modellers and the results are excellent*

FOR YOUR BOOKSHELF

STEAM IN ELECTRIFIED KENT

DOWN in a quiet corner of electrified Kent, steam is still master—and, what is more, on a narrow-gauge line. The system is operated by Bowaters, the paper manufacturers, at their Sittingbourne works.

Arthur G. Wells has written another handbook *Bowaters' Sittingbourne Railway* (Narrow Gauge Railway Society, 6s.) in the society's series. The system, he says, was built up by the original firm of Edward Lloyd. Today it still employs 13 steam engines, some of which began work over 50 years ago. When you first see these engines you feel for a moment that some queer magic has transported you to some such place as Fiji.

Bowaters' railway is not a relic of yesterday maintained for sentimental reasons. It is a highly efficient undertaking which contributes to the efficiency of the works. Throughout the day trains rumble along the 2 ft 6 in. line, hauling loads of raw materials from the company's own wharves to the vast factory, and returning with finished products to fill the gaping holds of the ships. The company also operate an extensive passenger service for employees as the works are spread out.

While the book is primarily addressed to the serious enthusiast, it has been written in such a way that anyone can understand it. Mr Wells thoroughly covers the growth and development of the company and its railway. The inclusion of the eye-witness account by Donald Maxwell in *Unknown Kent*, published in 1921, is particularly welcome.

For the model engineer the section on the locomotives will hold most interest. A complete absence of locomotive drawings is a surprising admission and not what we expect of a body like the NGRS.

The handbook has been produced on a duplicator. While the text is clear, some of the pictures are very poor, including Nos 8 and 9, two of the most important in the book. It is a pity that the NGRS has not used printed illustrations.

Did the track diagrams and the few drawings (all of wagons) have to be on separate sheets laid in the middle of the book? They are well reproduced, but stapling should have been used to attach them.

In short, the text has been sadly let down by the illustrations and production. The book gives the impression of having been hurriedly produced and is far below the standard of some of the society's earlier books, such as *Townsend Hook*. Nevertheless, the NGRS is to be congratulated on a book which will interest many. R.O.

WHILE SHIPS GO BY . . .

Continued from page 239

made in 1947, was installed two years later. It consists of two Davey, Paxman diesel engines, each a four-stroke six-cylinder, driving twin screws and giving her a speed of about 12 knots.

When the *Lochinvar* was no longer required on the Oban route, she was laid up and was finally bought by the Thames and Medway Navigation Company of Southend in the autumn of 1960. After an extensive refit in Tilbury tidal basin, she made her first voyage under new ownership in April 1961. At present she operates a regular ferry service between Southend Pierhead and Sheerness, making four round trips daily except on Fridays.

In the Highlands she carried occasional cars and some general cargo. A crane was fitted just forward of her funnel for this purpose. As no cargo is now carried, the crane jib was removed during the 1961-62 refit, considerably enhancing her appearance, which was, I think, further improved when she was repainted with a white strake along the upper part of her hull and a white dividing line between her red boot topping and black lower hull. Her funnel is buff.

The Master of the *Anzio I* for the present season is Captain Jack Matthews of Halfway, Sheerness, who was formerly skipper of War Department ammunition carriers in the Thames and East Coast areas. ▣

READERS' QUERIES

DO NOT FORGET THE QUERY COUPON ON THE LAST PAGE OF THIS ISSUE

- Queries must be within the scope of this journal and only one subject should be included in each letter.
- Valuation of models, or advice on selling cannot be undertaken.
- **Readers must send a stamped addressed envelope with each query and enclose a current query coupon from the last page of the issue.**
- Replies published are extracts from fuller answers sent through the post.
- Mark envelope "Query," Model Engineer, 19-20 Noel Street, London W1.

Worm gears

Looking through MODEL ENGINEER for 8 January 1953, I noticed on the centre page a drawing of the Savery launch engine with a worm and wheel at the condenser pump end. I may be able to use such a worm and wheel on a model of a lorry. Where can I get one?—C.B.W., Rock Hill, North Wales.

▲ *It is possible to obtain worm gears in quite a wide range of sizes and reduction ratios, from Bonds O' Euston Road Ltd, 357 Euston Road, London NW1. If you get their catalogue, you may be able to find a worm and wheel suitable for your purpose.*

Rotation of motor

I have recently bought a ¼ h.p. a.c. motor. While it is quite satisfactory in most respects, the direction of rotation is opposite to that required. Could you please tell me if there is any way in which I can reverse its direction?—J.H., Newcastle upon Tyne.

▲ *Presumably the motor is of the induction or squirrel-cage type. If it is, you can reverse the direction of rotation by changing over the connections on the starting winding only.*

Usually these motors are provided with two sets of terminals (four in all) for the main and starting windings.

It is often very easy to change over one pair of wires, but if only two terminals are provided you must trace the internal leads to the main and starting windings.

For Juliet

I wish to construct a boiler for a *Juliet* locomotive. My heating equipment is a lightweight outfit.

I would like your advice on the brazing rods or silver solder to be used and on the best method to be adopted in using oxy-acetylene.—G.F.R., Midsomer Norton, Bath.

▲ *Use Johnson Matthey's B6 brazing alloy for the barrel, outer wrapper and foundation ring, Easyflo No 2 for the firebox and backhead, and Easyflo No 1 for the tubes.*

In using oxy-acetylene equipment take great care to avoid burning the work. Only the outer part of the flame should touch the work, and the flame must be kept on the move all the time. It is also useful to flux the job thoroughly inside and out, before assembly.

Needed in Sydney

An article was once published in MODEL ENGINEER on the construction of a thread dial indicator suitable for an ML7 lathe.

As I want to make the indicator, I would like to know if the issue is in print.—T.G.C., Sydney, NSW.

▲ *The issue is out of print, but an indicator is quite simple to make. Its essential feature is a worm gear of a suitable pitch to engage with the threads of the leadscrew. It should have a number of teeth which is a multiple of the leadscrew. With a worm wheel of 16 teeth, engagement could be made at two opposite points of the dial for any whole number thread. Any threads having a factor of 2 or 4 could be engaged at correspondingly increased number of points of the dial.*

Lubricator

I am making the Stuart Turner beam engine as my first attempt at model engineering. After struggling with the cylinder I cannot work out where the cylinder displacement lubricator goes. Could you help me?—F.S., Madeley, Shropshire.

▲ *It is usual to fit a lubricator to the steam inlet pipe as close to the cylinder as practicable. If a stop valve for controlling the engine is fitted, the lubricator should be on the engine side of it.*

Lubricators of this type work because some condensation of steam takes place and the condensed water falls to the bottom, displacing oil which thus gradually flows into the steam pipe, and from there into the cylinder.

Grimshaw Hall

I have been a reader of ME for years. At the moment I am building a Hall class locomotive. I want to give it a name. Is *Grimshaw Hall* an engine of the Hall class?

At Knowle, not far from here, is a hall of that name visited by the first Queen Elizabeth; and my name in Grimshaw.—D.G., Shirley, Solihull, Warwickshire.

▲ *There is no Hall locomotive carrying the name* GRIMSHAW HALL. *This seems rather surprising in view of your remarks and the fact that the old GWR had to go outside Great Western territory to find names for their Hall engines.*

Springbok

Will you please comment on the materials which I am using to build the 5 in. *Springbok* by Martin Evans? Cylinder blocks machined from solid meehanite, pistons in stainless steel with rings fitted, crosshead guide-bars in stainless steel, and other valve gear parts in stainless, except the piston valve liners, for which I have phosphor bronze chill cast rod.

I am happy to see that Mr Evans' articles are now flowing again, and I wish all at Noel Street the very best.—J.D.G., Thorne, Doncaster.

▲ *Stainless steel for large pistons working in meehanite cylinders are not recommended. You are advised to use cast-iron pistons (with a small proportion of nickel in the iron) and rings in the same material. These would work well in meehanite cylinders.*

The slide bars could be mild steel, case-hardened, or a good high-carbon steel in the natural state, as it is better to allow the slide bar to wear than the crosshead.

Stainless steel is sound for valve gear parts and levers, with phosphor bronze bushes.

Chill-cast phosphor bronze for the liners, with stainless steel piston valves, should wear well.

Electric razor

I have a "Chilton Kub" single coil vibratory electric shaver of 230-240 volt rating.

Is it possible to rewind the coil

so that I may use it at 12 volts, say from a car battery? If so, what gauge wire and number of turns do you suggest I use? Many thanks for your very interesting magazine.—H.E.H., Southsea, Hampshire.

▲ *Vibratory electric razors are usually designed to work on a.c. supply only. Such a device could not be converted to operate on d.c. whether from high voltage mains or from a low voltage battery.*

To calculate the windings required you would have to know the number of turns in the existing winding, and also the amount of space available.

Bantam gear wheel

I have a Bantam (Colchester) 5 in. lathe and I require a fibre-toothed gear wheel for the main drive. Can you please tell me where I can obtain one?

I would also appreciate a description in your excellent magazine on some suitable occasion, of how one measures gear wheels in relation to pitch and diametral pitch, and how gear wheels are set in mesh.—C.H.G.S., Burton Joyce, Nottinghamshire.

▲ *The lathe mentioned is manufactured by the Colchester Lathe Co. Ltd, Colchester, Essex, and you could apply to them for any spares.*

The usual standard of gear measurement in Britain is known as the diametral pitch standard, which defines the number of teeth in a wheel per inch of diameter measured on the pitch line. This is taken at about half the tooth depth, and is the point at which the teeth theoretically make contact.

As an example of diametral pitch, a wheel of 3 in. pitch diameter, with 60 teeth, will be of 20 d.p. A 2 in. diameter wheel, with 32 teeth will be of 16 d.p.

The centre distances between two wheels running in mesh can be calculated by adding together their two pitch diameters and dividing by two.

Adjustable gears, such as lathe change wheels, are usually set to run together by trial, so that they run as quietly as possible with the minimum back-lash.

Zephyr

I am building the *Zephyr* (P.E.14) petrol engine. How is the cylinder turned in the shape illustrated, and what is the transfer cover made of? —S.M., Ratcliffe College, Leicester.

▲ *This engine was described in* 1946 *as an exercise in machining fairly complicated shapes from solid material, and in the articles, the particular methods employed were explained in detail. They involved a good deal of milling and shaping in the lathe which is not normally encountered in ordinary lathe practice.*

The cylinder and crankcase unit were first bored and machined externally, and then cross bored and screw cut for the crankcase, which was machined externally by milling or shaping. The transfer cover can be produced by turning a fairly large disc, boring it internally, and then cutting a segment from it. The ribs on the main bearing housing were produced by milling.

The articles on the engine were published in ME of May 16 *and* 30, *June* 13 *and* 27, *July* 11 *and* 25 *and August* 8, 1946. *Lens of Sutton,* 50 *Carshalton Road, Sutton, Surrey, may have the back numbers.*

Many ME readers have succeeded in constructing the engine with limited machine tool equipment.

Garden railway

In a half-acre, irregular garden I wish to lay out a passenger-carrying railway. None of the ground is level, and some inclines will be much greater than those on a real railway.

I have a quantity of $1\frac{1}{4}$ in. × $\frac{1}{2}$ in. section, and wonder if it would be suitable for a 5 in. or $7\frac{1}{4}$ in. gauge track. I do not know what the minimum radius should be for either.

Obviously, to cope with inclines, a tanker should be best. Perhaps you could give me a suitable source of information on hauling power, inclines, and so forth, or make recommendations? Apart from the obvious increase in weight, has the 0-6-0 any advantage over the 0-4-0?

Are any chairs obtainable for this sort of track or would I need to make them? What spacing of sleepers is usual?

Finally, perhaps you could give me the address of local clubs with equipment of this scale.—W.A.T., Oakamoor, Stoke-on-Trent.

▲ *Your rail section should be suitable for* 5 *in. or* $7\frac{1}{4}$ *in. gauge track. Although chairs would seem to suit it, the rail could be laid without them.*

The method of bolting the rails at the correct distance apart, by long bolts or studs put through steel tube about $\frac{3}{8}$ *in. dia., might be considered.*

Although wood sleepers are not essential, they make for a quieter track and provide an easy means of adjustment for height. They should not be less than 8 *in. long nor smaller in section than* 1 *in.* × $\frac{1}{2}$ *in. and they could be laid at* 3 *or* $3\frac{1}{2}$ *in. centres.*

The radius of the curves should be over 35 *ft, if possible, though* 20 *ft could be used in sidings.*

The 0-6-0 *will have better adhesion than the* 0-4-0, *and would run more steadily on the track. The* 5 *in. gauge* 0-6-0 MINX *was described in ME from* 1 *January* 1948 *to* 1 *September* 1949, *and a set of drawings can be supplied at* 50*s.*

You might also consider the 5 *in. gauge GWR* 2-6-2 *tank locomotive,* FIREFLY, *now being described in* MODEL ENGINEER. *Drawings* 1 *to* 12 *may be had at* 5*s.* 6*d. each.*

The complete set may be purchased for 54*s.*

Your nearest club would be the North Staffs Models Society, the secretary of which is Mr R. Hodge, 3 *Emery Avenue, Westlands, Newcastle, Staffs., or the Tamworth and District MES, whose secretary is Mr R. Hanson,* 75 *Summerfield Road, Tamworth, Staffs.*

Can You Help?

Readers who can offer information to those whose queries appear below are invited to write c/o Model Engineer. Letters will be forwarded

Small clutch

Could you please tell me the manufacturers of small clutches similar in design to the Myford clutch but with a V pulley of about 3 in. dia.? The power transmitter is $\frac{1}{7}$ h.p. at 1,425 r.p.m. The clutch is to replace direct drives on a 5 in. Little John centre lathe.—D.W., Bolton, Lancashire.

ME does not know of any clutch similar to that supplied by the Myford Engineering Company which would fulfil the conditions which you specify.

It would be rather difficult to transmit $\frac{1}{2}$ *h.p. at* 1,425 *r.p.m. through a small clutch no more than* 3 *in. in outside diameter. The type of friction clutch which would fulfil these conditions would be a rather complicated and expensive multi-plate unit.*

Plans for pistols

A friend of mine tells me that at various times ME has published plans for making old pistols.

As I have not been a reader very long, I would like to know when the plans were published.—P.T., Knaresborough, Yorkshire.

[*Perhaps an older reader knows?* —EDITOR.]

POSTBAG

The Editor welcomes letters for these columns. A PM Book Voucher for 10s. 6d. will be paid for each picture printed. Letters may be condensed or edited

SIR,—In your magazine of 2 August the report of Wimbish Traction Engine Rally included a picture of an engine with a little boy beside it.

The caption said that, to the little boy on the left of the picture, these engines must seem like strange, new inventions. I recognise this picture to be of myself. I have been interested in traction engines for more than a year.

In 1961, along with ten other boys, a friend and I started the Lillington Traction Engine Club. All the members have model engines made from Meccano and odds and ends. They include three Burrells (one is mine), a Foster, a Clayton and Shuttleworth, an Aveling and Porter, and a Ruston and Hornsby.

We have rallies and steam afternoons at which we hold competitions and obstacle races, etc.

Leamington. J. GAULT.

[*Our enterprising young friend included a snapshot of his model Burrell, but unfortunately it was too small to reproduce properly in the magazine. Congratulations to this band of youngsters for the initiative they are showing.*—EDITOR.]

AMERICAN MODELS

SIR,—A catalogue of kits, prints and instructions for the construction of model traction engines may be had for a dollar from Charles J. Arnold and Son, Box 177, Junction City, Oregon. This firm offers a 2 in. scale J. I. Case 6 h.p. 1915 model and a 1½ in. scale freelance by Tiny Power.

Charles A. Cole, Box 788, Ventura, California, has a catalogue at one dollar and offers a 1 in. scale J. I. Case 65 h.p. 1915 model.

Havelock, JOHN D. LATHAM.
North Carolina.

WHERE ARE THEY?

SIR,—With so much interest shown in traction engines, I have wondered if there are any blacksmiths left, either working on their own or in conjunction with larger works. Who makes the shoes for racehorses?

At Easter I was at Maisons-Laffite, 12 miles north-west of Paris, and visited a small firm making horseshoes from sectional material, mild steel and aluminium. The correct length was cropped off and holes were punched and bent to shape.

Quite an international business seemed to be enjoyed by this small concern.

Wembley, J. H. DAVIS.
Middlesex.

GONE FOR SCRAP ?

SIR,—Mrs Gilby and I were on holiday at Southsea recently and when returning to our caravan site for the first time I turned right a little too soon into Locksway Road. There I stopped at a scrapyard where there were several interesting items I thought should not be there. There were two old guns and a Leyland fire escape.

In these days of diesel railcars, it was a treat to see a passenger train still hauled by a 0-6-0 tank engine, No 32640. This was on Hayling Island.

Thorney, HERBERT E. GILBY.
Peterborough.

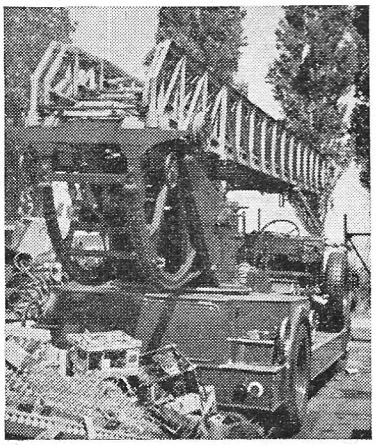
IN SCHOOL

SIR,—As a metalwork master in a Secondary Modern School I have always believed in promoting a general course in metalwork covering the skills listed in a letter to ME from a reader in Norfolk.

But some three years ago, feeling that the domestic applications of metal had their limitations, I decided that some kind of working models would be a truer outlet for work involving steels, taps and dies, lathes and so forth; and so I began to take ME in the hope that you would provide us with some ideas.

Model locomotives seemed to be one answer, but I realised quite soon the impracticability of the idea. I eventually found an oscillating engine in a metalwork book and two boys made models that worked quite well. Patience was rewarded last September when, after attending a short course on model engine making, and buying a set of booklets compiled by the course instructor, I was able to introduce model engines into my scheme. Since then, about 15 boys have made a small oscillating engine.

Now, the standard of skills demanded would no doubt be frowned upon by the skilled model engineer —the safety factors are well looked after—but we have produced some very efficient working models and in making them have brought in the many different branches of metalwork referred to by your previous correspondents. And so as far as I am concerned, some form of modelling can be very rewarding in Secondary Modern Schools.



Watched by a line of lofty Lombardy poplars, a Leyland fire escape lies in a Hampshire scrapyard awaiting its fate. What does the future hold?

Boys would get far more from a series on simple modelling than by gazing at the splendid feats of the skilled model engineer.

With regard to the Norfolk reader's final point—no follow up after a boy has left school—surely here is an opening for Evening Institute Further Education work? In my experience quite a number of boys, when they go to work among machines, are able to handle metal with a sureness they were never quite aware of during their school life. One boy who left last August has been back to school asking for

plans for the Stuart 10 engine referred to in ME.

The facilities are there and the skills develop. Why not have modelling in the Secondary Modern School and continue it in Further Education? I know of one school that does this. The problem is to get boys to progress in easy stages. Here MODEL ENGINEER could help by giving us a range of models to be made by the enthusiastic modern schoolboy.

Darfield, Yorks. H. SCHOFIELD.

QUICK-FIRER

SIR,—With reference to the letter from Mr A. L. Hayes [June 7], I think I have found an answer to his query. I enclose a picture taken from MODEL ENGINEER of 25 March 1920, showing two views of a model Maxim Nordenfeldt Quick-Firing Gun built by A. Maytum, which I believe to be the same as the incompleted model shown by Mr Hayes.

Sutton Coldfield, Warwickshire. M. SPINKS.

PLOUGHERS

SIR,—In the Rev. R. C. Stebbing's second instalment on ploughing engines there are two points which I would like clarified if possible.

In both Barry Finch's booklet and the Road Locomotive Society's *Some Ploughing Engines*, Fowlers Nos 14726/7 are given as class AA7, but Mr Stebbing says that they are Class AA, with ZA cylinders.

Secondly, No 15563 is AA7, according to Barry Finch, but AA according to Mr Stebbing. Is this engine an AA, externally like an AA7, but with AA cylinders?

Bishopston. KEITH M. VIGUS.

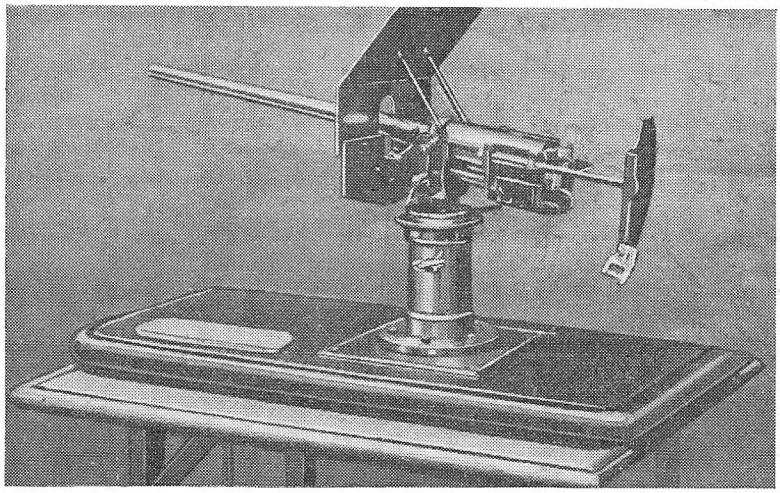
Rev. R. C. Stebbing replies: My notes on ploughing engines were written in two parts, and the division into three left the second episode, as in all good serials, at a crucial point!

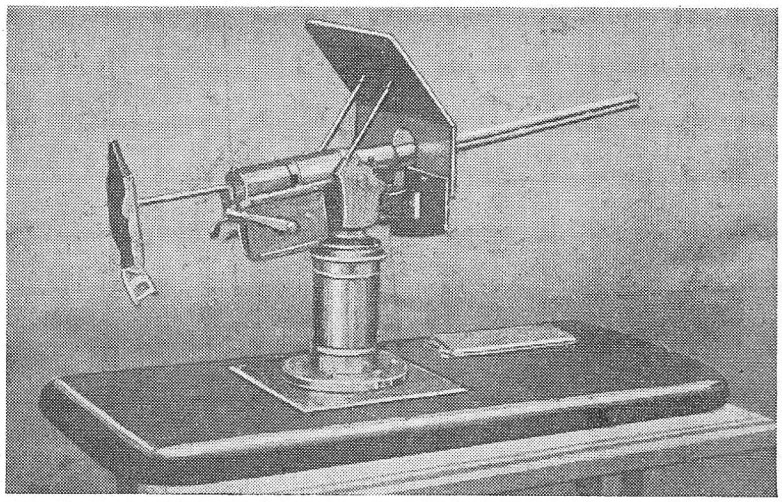
The AA was built with successive modifications as AA1, AA2, and so forth. Only fragmentary records remain of some of these varieties. The standard cylinder size was 7 in. and 12 in. × 12 in. stroke. Some engines, otherwise identical as far as I know, with one or other of these varieties, were known as ZAA, and later ZA, with cylinders 7½ in. and 13 in. × 12 in. From memory, all the ZA engines were exported, and I believe the opinion at Leeds was that the smaller cylinder was ample for home purposes. There were also ZA1S and ZA2S superheated engines.

With the outbreak of the 1914-18 War the classification of these types in the order book was generally just AA. Quite a number of boilers (the boiler being the component given the number) seem to have been put in hand for export and later used for home orders, and I have suspected variation from the former classification when the engines were built up. Certainly, some of these were used for the Ministry of Munition's order for 15232 and 15257, the first called AA7 with 7½ in. × 13 in. cylinders, "cage" pattern road gear, coal bunker with extended top, and certain new minor fittings. The large cylinders were used to satisfy John Allen (later Sir John) who had a say in the Government programme.

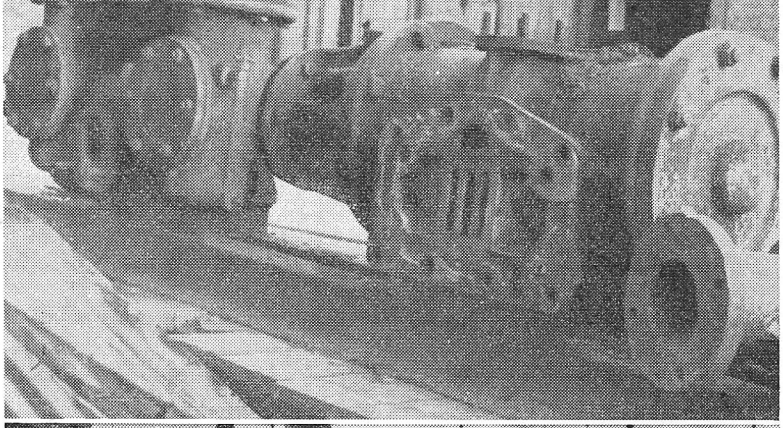
The first of these sets was delivered in December 1917. Two sets 14726 to 7, and 8 to 9, came out in 1918 with the old bell pinion road gear, differentiating them from the true AA7. Although most post-war AA engines were classified AA7, one batch were called just AA, 7 in. and 12 in., which included 15563-4.

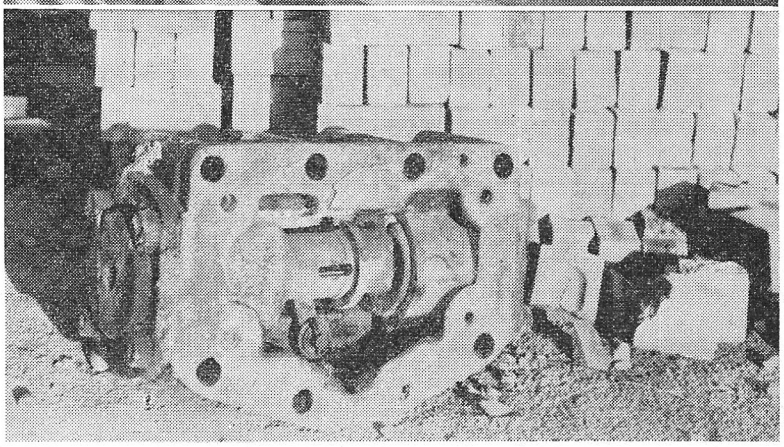
If you have your ME with the article on Walter Keeling and Nos 13880-1, built in 1917 and also just called AA, you can compare the AA7 with the outward appearance of the AA2. The classification I have given has been taken from the Fowler Order Books (now destroyed) and I must say that it is confusing. —EDITOR.





From the files of MODEL ENGINEER *comes the answer to Mr A. L. Hayes' problem. Two views of a model of a Maxim Nordenfeldt Quick-Firer which Mr M. Spinks found in 25 March* 1920 *issue*





Model engineers have a remarkable ability for unearthing old mechanical treasures. Mr E. H. Jeynes discovered this trusty Evans' steam pump while on a visit to a Warwickshire colliery

COMPLICATED CYCLE

SIR,—While at a Warwickshire colliery recently, I saw an old steam pump brought to the surface, and noticing the short distance between the cylinder and pump glands, I was puzzled how the slide valve had been operated.

The valve chest was not with the pump, but I found it lying beside the track. The mystery was now solved. I recognised the works of one of Evans' Cornish cylinders.

The valve chest contains two single-acting short-stroke cylinders, having covers at each end of the chest, and a common trunk piston which is fitted with rings at either end. In the centre are two flanges which accommodate a semi-circular recess in the back of the slide valve.

Arranged concentrically within the piston, is a double-ended piston valve, having hand operated movement for starting. When steam is admitted to the valve chest, one of the open main ports admits steam to the pump cylinder. While the main piston is moving, pressure is building up via a bleed port in the valve cylinder, which moves the valve across for the return stroke.

The valve cylinders exhaust into the main exhaust passage, steam cushioning being provided to prevent the piston's striking either end cover.

In the photograph of the valve face, the inlet and exhaust passages for the valve cylinders can be seen; the inlet at the top, the exhaust at the bottom.

Bore and stroke of the steam cylinder was 14 in. × 24 in., while that of the double-acting pump was 7 in. × 24 in.

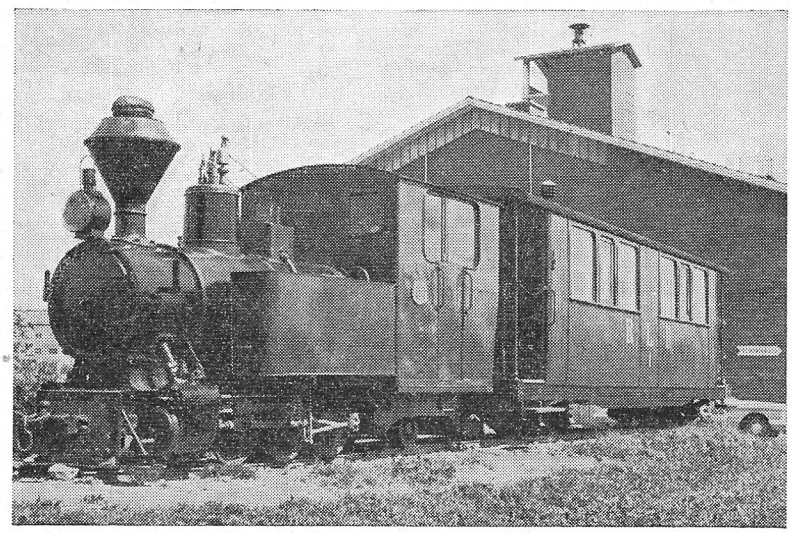
The cylinder was not lagged, nor were drain cocks fitted. A note in Evans' catalogue for 1911, states that as the ports were level with the exhaust passage, drainage was unnecessary.

These pumps were also made in vertical form, with the valve chest arranged so as to be horizontal, a type that was extensively used in mine shaft sinking operations.

Another unusual feature was that a chamber could be supplied, to be fitted in the suction side of the pump, to which the exhaust from the pump cylinder was connected, it being claimed that a great saving accrued from the extra vacuum thus obtained.

All this seems to point to a very complicated cycle of events, but the maintenance foreman assured me that this pump had given many years' unfailing service, and had required but little attention.

Newcastle on Tyne. E. H. JEYNES.



Henri Girod-Eymery, a French reader of ME, came across this well-preserved locomotive and coach while holidaying in Finland

PRESERVED BY FINNS

SIR,—During a visit to Finland, I stopped for a cup of coffee at Rihimaki, north of Helsinki, and saw this locomotive, with a coach, well preserved as a museum piece.

The wood burner was built at Tampere (Tammersfors in Sweden) in 1912. I think it may interest other readers of your fine magazine.

Paris. HENRI GIROD-EYMERY.

CLUB NEWS

Send news and notices to The CLUBMAN, 19-20 Noel Street, London W1

COLCHESTER TRACK

THE Colchester SMEE has recently purchased a piece of ground to use as a permanent track site. It measures 132 ft × 264 ft and will allow them to build a 480 ft oval track suitable for 5 in., 3½ in. and 2½ in. gauge locomotives, and still leave room for a car park.

About 20 members have started to clear the site but the society feels that there may be many lone-hands in the NE corner of Essex who would like to join the Colchester society and lend a hand in this venture.

The plot is on the western boundary of Colchester, about a mile from the main London road. It was formerly a small-holding, and there are many fruit trees to improve the scenic amenities of the track—but there are also many pig sties, old sheds and a good deal of rubbish to be cleared away.

If the present enthusiasm remains, part of the track ought to be ready for steaming by the end of next year. Three members are optimistic; they are already building locomotives!

The project is the culmination of many years' saving and negotiations. The society sincerely hope it will encourage some of the members who have left the club to return.

SOUTHEND SHOW

Tomorrow an exhibition of models will be opened at the Southend-on-Sea Pier Head. The theme of the show is "Ships that Pass the Pier," and it will include the Thames Estuary paddle steamers. The models group of the Paddle Steamer Preservation Society has helped considerably and it will have many fine models on show.

The exhibition is being staged until September 15.

TRAMS AND TRAINS

On Saturday, October 13, at Euston Dining Club, Cardington Street, London NW1, the Gauge O Group of the Tramway and Light Railway Society is presenting another of its special evenings. This time the entertainment will consist of 200 slides of tramway and electric railway interest.

The meeting, which begins at 6.30 p.m., is free. There will be a break in the two-hour show for refreshments. Further details are available from Mr D. C. Bradley, of 19 Stuart Road, Thornton Heath, Surrey.

ELTHAM COMPETITION

The Eltham and District Locomotive Society is holding a competition next March for members who are building their first model. There are six entries already. One of these is a 3½ in. gauge *Jubilee*, and at the society's next meeting on September 6 Mr W. Gilmour will describe how he built it. As usual the meeting will be at 8 p.m. sharp at the Beehive Hotel, Eltham. Visitors are sure of a good welcome.

The secretary is Mr F. H. Bradford of 19 South Park Crescent, London SE5.

SPEED OF THINGS TO COME

The Durban SME has expressed concern in its monthly bulletin about excessive speed on the track at Kellaway Park. Previous requests for co-operation in this matter, says the Society, have been completely ignored. Prevention is better than the litigation that may follow an accident, observes the bulletin.

The Society urges that speedsters, who may not be in a position to assess their rate of travel, should accept the judgment of the observer, who may be better equipped to give a detached opinion. Or would this be hurting their pride too much? asks the writer.

The mania for speed has not, so far, become a menace to track users in Britain. One or two American visitors have told Vulcan of their concern about speedsters, so the Durban club's experience is not isolated.

RALLY ROUND

September 8-9 Ickleton Rally. *Organised in aid of the Ickleton village Church and School. To be held at Ickleton, near Audley End and Saffron Walden, Essex.*

September 15 Fakenham Rally. *To be held at Fakenham, a few miles NW of East Dereham, Norfolk.*

September 22 Kelvedon Rally. *Organised by the East Anglian Traction Engine Club. To be held at Kelvedon, near Colchester, Essex.*

CLUB DIARY

Dates must be sent at least four weeks before the event

August 23 Eltham Small Locomotive Society. Visit to Maidstone MES track at Mote Park.

August 24 Greenwich and District SMS. Intermediate meeting at the Newton Room, Charlton House, Charlton SE7.

August 24 Coventry MES. Clubroom meeting.

August 25 North London SME. Portable track at Friern Barnet Summer Show at Friary Park.

August 25 York SMEE. Public running day at Bishopsthorpe.

August 26 Norwich SME. Public running at Eaton Park, Norwich at 3 p.m.

August 26 Brighouse and Halifax SMEE. Club visiting day.

August 26 Leicester SME. Open day at the track for private running.

August 26 City of Leeds SMEE. Working meeting at Temple Newsam at 9 a.m.

August 26 Woburn MPBC. SP regatta at Duncombe Breeches, Woburn Abbey.

August 26 Wulfruna MPBC. Regatta for RC craft at West Park, Wolverhampton.

August 26 North London SME. Regatta, Woburn Abbey, Duncombe Breeches.

August 26 North London SME. Wulfruna regatta, West Park, Wolverhampton.

August 27-31 Greenwich and District SMS. Set up Exhibition of ship models in the Long Gallery, Charlton House, Charlton, London SE7.

August 27 Leicester SME. Ordinary meeting.

August 27 Sutton Coldfield MES. Open night.

August 28 City of Leeds SMEE. Working meeting at Temple Newsam at 6 p.m.

September 1 Chingford and District MEC. Portable track at Whipps Cross Hospital fete.

September 1 Dowty Sports and Social Society, Ashchurch Model Makers, the Cheltenham SMEE and Historical MRS will be represented at exhibition and open day at Ashchurch Factories, Arle Court, Cheltenham.

September 1 Brighouse and Halifax SMEE. Public open day.

September 1 Cambridge MES. Track day at Fullbrooke Road, Cambridge.

September 1-8 Metropolitan SMS. Exhibition of ship models at Charlton House, Charlton, SE7. Open from 2.30 p.m. to 9 p.m.

September 1-2 City of Leeds SMEE. Public open day at Temple Newsam at 2.30 p.m.

September 2 Maidstone MES. Track day at Mote Park.

September 2 Coventry MES. Public running.

September 2 Malden SME. Track day at Claygate Lane, Thames Ditton, Surrey.

September 2 MPBA. Grand regatta at Victoria Park, London, E.

September 4 City of Leeds SMEE. Discussion on the winter programme at Salem Chapel at 7.30 p.m.

September 5 Southampton and District SME. Meeting, 20, Carlton Crescent, 8 p.m.

September 5 North Staffs MS. Pitfield House, Brampton, Newcastle, meeting 7.30.

September 6 Coventry MES. Clubroom meeting.

September 7 Rochdale SMEE. General meeting at Lea Hall, Smith Street, Rochdale at 7.30 p.m.

September 7-9 Nauticus. RC, SR and SP International at Ulm, Germany.

September 8-9 Huddersfield SME. Annual Locomotive rally and model power boat regatta at Highfields. All clubs invited.

September 8-9 MYA. 10-rater championships at Hove.

September 8-9 City of Leeds SMEE. Club invitation day at 2.30 p.m.

September 8-9 West Midlands MPBA. Huddersfield regatta.

September 8-9 Huddersfield SME. Track day and regatta at Highfields, Huddersfield at 11 a.m.

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For Sale. "Manual of Model Steam Locomotive Construction," by Percival Marshall, fair condition, £1. Write to—J. D. HALL, 26, Tudor Court, North Wembley, Middlesex.

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Bassett Lowke Eclipse, engine £4 10s.—WATSON, 7, Starkey Crescent, Tang Hall, York.

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Accumulator Charger, Westinghouse metal rectification, 3 circuits, suitable for charging large accumulators for passenger carrying locomotives, 230-250 v. a.c., input. For sketch and particulars, s.a.e. Also Hercules Corvette moped, new never been on road, value £58, offers considered, or would exchange for 5″ locomotive, stationary steam engine and boiler. Cash available for difference in price.—615, Southchurch Road, Southend-on-Sea.

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A.C. Motors, Self-Start, induction, 200/250 v., 50 cycles, 1-phase, 1,425 r.p.m., ¼ h.p. 87s. 6d., 1/3 h.p., 105s., ½ h.p., £6 15s. Perfect and guaranteed, carriage England, 7s. 6d.—JOHNSON ENGINEERING COMPANY, 319, Kennington Road, S.E.1. RELiance 1412/3.

Synchronous Clock Motors. 200/250 v. a.c., 50 c. with geared mechanisms. Various types, large stock, 7s. 6d. each. Quantity reduction.—TRADEX METER COMPANY LTD., 67, Maple Road, Surbiton, Surrey. Tel.: ELMbridge 2234/5/6/.

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Projectors. Home assembly kits from £6 2s. 6d. Fan base kit, £3 7s. 6d. Opticals: screens. S.A.E.—MARSHALL SMITH LTD., 64, Norwich Avenue, Bournemouth.

(Continued on p. vi.)

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Ploughing Engines at Work. Fifty-eight full-page photographs by Barry J. Finch. Very few ploughing engines can be seen at rallies, but the very fine collection of photographs in this book show them at their work of ploughing, mole draining, cultivation, dredging and ditching and include some close-up pictures of equipment used for these operations. 3s. 6d. from your bookseller or 4s. post paid from Percival Marshall & Co. Ltd., 19-20, Noel Street, London, W.1. (U.S.A. and Canada $1.00.)

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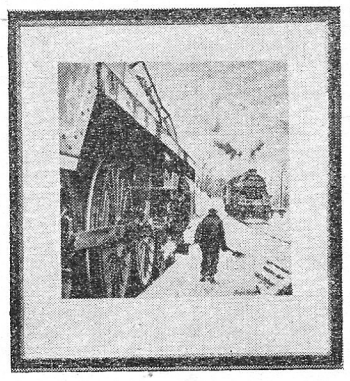

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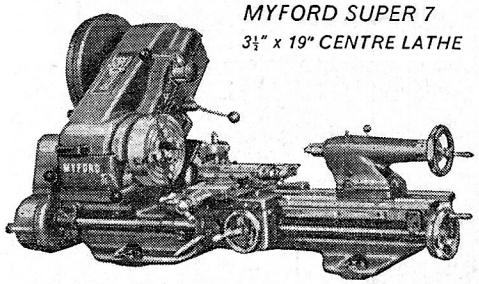

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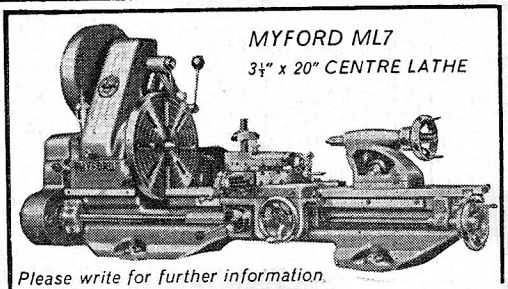

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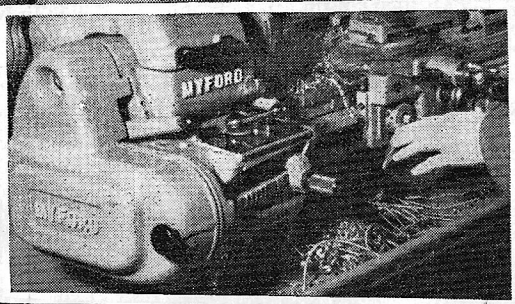

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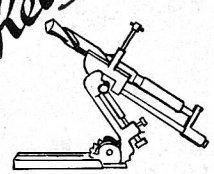

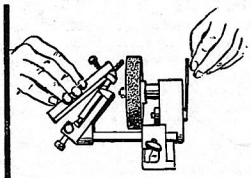

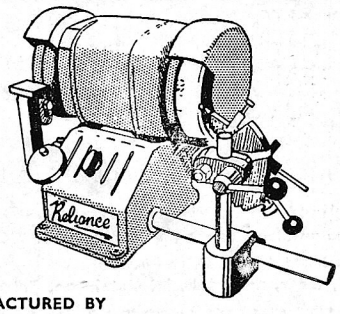

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